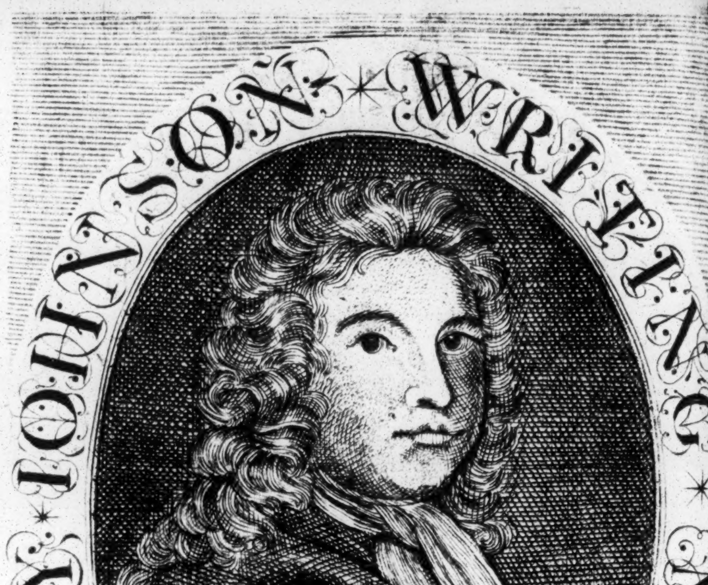


*HODDER and COCKER in their Time did well,*
*But JOHNSON's never thought to do more excel*
*What unimprov'd from ancient Rules they taught*
*Is by his Judgment to Perfection brought.*

John Eyles



# A New Treatiſe Of Practical ARITHMETICK,

DONE

In a Plain and Eaſy Way for the Uſe of All, but eſpecially for the meaneſt Capacity to attain a full underſtanding of that moſt excellent and uſeful Science, with great Improvements.

*CONTAINING,*

Numeration, Addition, Subſtraction, Multiplication, Diviſion, Reductions of Coin, Weights, and Meaſure, the Golden Rules of Three, Single and Double, Direct and Reverſe, Rules of Practice, Tare and Trett, Fellowſhip Single and Double, Barter, Loſs and Gain, Intereſt Simple and Compound, Rebate or Diſcount, Exchange of Coin, Vulgar Fractions, Extraction of the Square and Cube Roots, Meaſuring of Board, Glazing, Wainſcot, Painting, Timber Stone, *&c.*

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The Fourth Edition.

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By *HUMPHRY JOHNSON*, Writing-Maſter in *Old-Bedlam-C urt* without *Biſhopſgate*, where Youth may be Boarded.

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*LONDON*: Printed for *Tho. Wood* and Sold by *A.Gifford*, in *Old-Bedlam* without *Biſhopſgate* 17 9

To the Honourable

# Harry Bridges, Esq;

## Of *KEYNSHAM*

## In the County of *Somerset.*

Honoured Sir,

*THE Profoundness of your Knowledge in the Liberal Sciences, your exquisite Skill in both the Learned and Modern Languages, (acquir'd by long Travels, great Experience, and indefatigable Study) is too perspicuously known to doubt of your Judgment in Matters of this Nature.*

*And the good Affection you have always shewn to this useful Science in particular (being the Basis whereon are erected all those beauteous Fabricks and noble Superstructures in the Mathematicks) makes me bold to shelter the following Treatise under your Protection.*

*Humbly entreating your Acceptance thereof in Acknowledgment of unmerited Favours conferr'd on,*

Honoured Sir,
Your most obliged
Humble Servant,

A 2 *Humphry Johnson.*

# Advice to the READER.

*Friendly Reader*,

AT the Deſire of a Friend, I have drawn up the following Sheets; wherein I have endeavour'd to make that uſeful Science of *Arithmetick* eaſy to be learn'd by the meaneſt Capacity; and that without a Tutor: And the better to accompliſh this my Deſign, (or make my Endeavours effectual) I have obſerv'd the following Method; namely,

1. I have explain'd all the Terms of Art: Which I have done in their proper Places, at the beginning of each Chapter. And,

2. I have explain'd all the *Hard Words* (in the whole Book) which I thought would be any thing difficult to a common Reader. And this I have done by inſerting their Signification in a Crotchet, thus; *Definition* [or *Explanation*;] a *Unit* [or *One*;] *Ergo* [*therefore*,] and ſo of the reſt. For I know by Experience, that the not underſtanding the *Terms* and Words of any Diſcourſe, is commonly the chief thing that hinders a Learner from underſtanding the Matter. And yet for any one to learn an Art without its Terms, is very ridiculous.

3. I

3. I have been very large upon the ſix firſt Rules, (namely, Numeration, Addition, Subſtraction, Multiplication, Diviſion, and the Golden Rule,) becauſe I would make them plain and eaſy to be learn'd by the meaneſt Capacity, and becauſe theſe Rules are of abſolute Uſe and Neceſſity to Men of all Degrees and Profeſſions whatſoever: And many Men *will not*, nor *need not*, learn any farther, their Buſineſs not requiring it.

4. I have been brief in the reſt of the Rules; becauſe he that perfectly underſtands the ſix firſt Rules, will eaſily learn the reſt, they being all perform'd by ſome one or more of theſe.

5. Laſtly, (which is not the leaſt Means to make my Endeavours anſwer Expectation) I have expreſs'd the ſame Words in Writing that I uſed to do to my Scholars by Word of Mouth; and therefore I hope they will have the ſame good Effect upon thoſe that I know.

And now in learning this ſo neceſſary Art of *Arithmetick*, I adviſe you,

1. To get a perfect Underſtanding of the Terms explain'd in the Beginning of each Chapter. And,

2. Mark well the Signification of an[y] Hard-words where-ever you find them ex[-] plain'd; for the not underſtanding of *theſe* will be a great hindrance to the under[-] ſtanding of the Rules.

3. I adviſe you to be perfect in one Rule, before you undertake to learn the next: And be not deſirous to paſs on for[-] ward, till you are very ready in that which goes before; for the filling the Head with too many things at once, does but diſtract a Learner's Fancy, and diſturb his Appre-henſion. Therefore endeavour to be very perfect in *Numeration*, before you meddle with *Addition*; and in *Addition* before you undertake to learn *Subſtraction*; and ſo of the reſt: For a perfect Knowledge of one Rule will be a great Help to you in learning the next, becauſe they have generally a Dependance one upon ano-ther.

And by this Method of Proceeding, you may make your ſelf Maſter of *Arithme-tick*, or at leaſt arrive to a competent Know-ledge thereof with eaſe, and in a very ſhort ſpace of time.

*From my School in*
Old-Bedlam Court
*without* Biſhopſgate
*LONDON.*

*Humphry Johnſon.*

If *grateful* Muses *soar up to the Skies,*
*T' exalt the* Useful Labours *of the* Wise,
*Who lonesome Paths do times repeated tread,*
*That by their Footsteps others may be led*
*When they're dissolv'd, and scatter'd with the Dead;*
*Shan't the unwearied* Numerist's *Praises shine*
*I'th' Lineage, endless as his* Art *sublime?*
*Oh* Sacred Genius *whence those Rules did spring!*
*What Tongue can praise, or Muse its Worth can sing?*
*Whence Use and Profit gratefully arise,*
*Delight the Mind, and leave it in Surprize.*
Writing *alone in Competition stands,*
*And with her Sister* Art *goes hand in hand:*
*The Soul of Business, and the Life of Trade,*
Writing *the Heart,* Arithmetick *the Head:*
*Both are with just and equal Praises crown'd,*
*The noblest Arts by Nature ever found.*

# ARITHMETICK.

## PROEM or PREFACE.

THE Science of *Arithmetick* is thought to be covetous (or of the ſame Age or Time) with the World, or leaſt with the first Ages thereof. I ſhall not ſtand to give an Account of its firſt *Inventor*; that being ſo uncertain: Nor ſhall I much inſiſt on the Excellency and *Uſefulneſs* thereof; that being ſo generally known and believ'd.

Yet I cannot forbear to take notice in general, That, by many ancient Writers and grave Philoſophers, this Science has been accounted the *Primum Mobile*, (or firſt Mover) not only of all Mathematical Sciences, but of all Mundane Affairs in general: And 'tis uſeful for all Sorts and Degrees of Men, from the higheſt to the loweſt.

CHAP.

# CHAP. I.

## *The General Introduction.*

BRevity (as far as it may consist with Perspicuity) being the Design of the following Discourse, I shall not here insist on the many (and various) *Definitions of Arithmetick*, that are set down by the several Authors that write of this Subject: Yet (because the *Natural Method of Teaching any Art, is in the first Place to explain the Terms belonging to it)* I shall *here* say, That,

I. *Arithmetick* is (commonly) defin'd to be, *The Art of Numbring*, or *Casting Accompt*.

In order to a clear Understanding of which Definition, it will be necessary here to consider what is meant by the Word *Number*.

II. *Number is that by which is explain'd the Quantity fo any Thing.* For Example,

Suppose in a Heap of Corn, it were demanded how much there were? If the Answer were only *Bushel*, or *Bushels*, it will be unsatisfactory: It must therefore have some Number prefix'd to it (as, Nine, Three, One, Half-a-One, or the like) before the Answer can be satisfactory, or indeed intelligible. So that 'tis plain, *Number is, that by which we explain the Quantity of Things.*

III. There was a Time when Names of Numbers were unknown, even among civiliz'd Nations; and probably they then apply'd the Fingers (of one or both Hands) to things whereof they would keep account, (as is yet done amongst the illiterate *Indians*;) and thence it may be that the numeral Words are but Ten in any Language; (and some but Five,) and then they be-

gin again; as, after *Decim, Undecim, Duodecim,* &c. as it were, Ten and One, Ten and Two, *&c* So we in *Great-Britain* (not much different) after Ten, count Eleven, Twelve, Thirteen, Fourteen, *&c.* as if Three and Ten, Four and Ten, *&c.*

IV. The *Ancients* expreſs Numbers by Letters; amongſt whom, thoſe of moſt Note, were the *Greeks* and *Romans*; the former of which, (namely the *Greeks*,) made the Letters ſignificant according to the Order of the Alphabet; thus, α ſignified One, β Two, γ Three, *&c.* ι Ten, ια Eleven, ιβ Twelve, ιγ Thirteen, *&c.* κ Twenty, λ Thirty, μ Forty, ν Fifty, *&c.* But the *Romans* made their Letters ſignificant more irregularly; for with them,

| | | |
|---|---|---|
| I | | One. |
| V | | Five. |
| X | | Ten. |
| L | ſignified | Fifty. |
| C | | a Hundred. |
| D | | Five Hundred. |
| M | | a Thouſand, *&c.* |

V. But the Moderns do generally expreſs Numbers by certain Characters, though by moſt to be invented by the *Arabians*, (though ſome think they receiv'd them from the *Chineſe*:) theſe *Characters* are by the *Arabians* call'd *Ziphers*; by the *Hebrews*, *Sephers*; and by *Us*, *Cyphers*; but more commonly Figures.

VI. Theſe *Characters* or *Figures* are capable to expreſs any Number, tho' never ſo great; and yet they are but Ten in Number, thus named and characterized.

*Characters.*

| *Characters.* | | *Names.* |
|---|---|---|
| 1 | ———— | One |
| 2 | ———— | Two |
| 3 | ———— | Three |
| 4 | ———— | Four |
| 5 | ———— | Five |
| 6 | ———— | Six |
| 7 | ———— | Seven |
| 8 | ———— | Eight |
| 9 | ———— | Nine |
| 0 | ———— | a Null, or Cypher. |

Of theſe, the laſt is of no Value, but ſerves only to encreaſe the Value of the reſt; as ſhall be ſhewn in the next Chapter.

VII. All Numbers expreſt by one ſingle Figure are call'd *Digit-Numbers*, ſo there can be but nine Digits; namely, 1, 2, 3, 4, 5, 6, 7, 8, 9.

VIII. All Numbers expreſt by one Digit, with one or more Cyphers annexed, are called *Article-Numbers*; ſuch are, 10 [ Ten ] 20 [ Twenty ] 30 [ Thirty ], *&c.* 100 [ one Hundred ] 200 [ two Hundred ] *&c.*

IX. All Numbers expreſt by many Digits alone, or by many Digits and Cyphers ſtanding together promiſcuouſly, are call'd mix'd or compound Numbers: ſuch are 11 [ Eleven ] 12 [ Twelve ] 21 [Twenty One] 102 [One Hundred and two] 220 [Two Hundred and twenty] *&c.*

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## CHAP. II.

### *Of NUMERATION.*

1. NUmeration, is that Rule in Arithmetick, which *teacheth* how to read [ or expreſs in Words] any Number that is ſet (or written) down in Figures; and how to ſet down in Figures,

gures, any Sum or Number that ſhall be required.

II. For performing this, you muſt know, That every one of the nine Digits has a different Value according to the Place he ſtands in, And,

III. Theſe Places are counted from the Right-hand toward the Left; thus,

6 First Place.
2 Second Place.
5 Third Place.
3 Fourth Place.

7 5 2 Second pla Third Fourth

IV. Now, if a Figure ſtand alone, or in the firſt Place, it ſignifies but its own ſingle Value; but ſtanding in the ſecond Place, it ſignifies ten times its ſingle Value; in the third Place, a hundred times; in the fourth Place a thouſand times; and ſo on; every Place forward towards the Left-hand encreaſing its Value ten times as much as was before. So in the Example in the foregoing third Section, the Figure 3 (ſtanding in the firſt Place) ſignifies the three *Units*, or ſimply *Three*, and no more; the Figure 5 (in the ſecond Place) ſignifies *Five Tens* or *Fifty*; ſo 53 is *Fifty Three*: the Figure 2 (in the third Place) is *Two hundred*; ſo 253 is *Two hundred Fifty three*: the Figure 6 (in the fourth Place) is *Six Thouſand*; ſo 6253 is to be read thus, *Six Thouſand Two Hundred Fifty Three*.

In like manner, if any Figure has a Cypher (or Cyphers) join'd with it, it ſhall ſtill keep the Value of its Place as much as if a ſignifying Figure ſtood in the Room of the Cypher or Cyphers. So if inſtead of the 3 (in the foregoing Example) there were a Cypher in the firſt Place, thus 6250, the other Figures ſhall keep the ſame Value of their

Places

Places that they did before; namely, *Six Thousand Two Hundred and Fifty.*

V. Thus you may read any 4 Figures: But if the Number consist of more than 4 Places, observe the following Table.

| The Value of each Figuere, according to the Place that he stands in. | Examples for the Learner's Practice. | | | | | | The Number of the Places. |
|---|---|---|---|---|---|---|---|
| Units. | 4 | 0 | 0 | 0 | 0 | 4 | First. |
| Tens. | 3 | 7 | 0 | 0 | 3 | 0 | Second. |
| Hundreds. | 2 | 6 | 9 | 0 | 0 | 3 | Third. |
| Thousands. | 1 | 5 | 8 | 1 | 2 | 0 | Fourth. |
| Tens of Thousands. | 9 | 4 | 7 | 9 | 1 | 2 | Fifth. |
| Hundreds of Thousands. | 8 | 3 | 6 | 8 | 9 | 1 | Sixth. |
| Millions. | 7 | 2 | 5 | 7 | 8 | 0 | Seventh. |
| Tens of Millions. | 6 | 1 | 4 | 6 | 7 | 9 | Eighth. |
| Hundred of Millions. | 5 | 9 | 3 | 5 | 6 | 8 | Ninth. |
| Thousands of Millions. | 4 | 8 | 2 | 4 | 5 | 7 | Tenth |
| Tens of Thousands of Millions. | 3 | 7 | 1 | 3 | 4 | 6 | Eleventh. |
| Hundreds of Thousands of Millions | 2 | 6 | 9 | 2 | 3 | 5 | Twelfth. |
| Millions of Millions. | 1 | 5 | 8 | 1 | 2 | 4 | Thirteenth. |

In

In the foregoing Table, I have laid down ſix different Examples, for the Learner's Practice; each of them continued to thirteen Places, which is far enough for any common Practice.

VI. In the Practice of Numeration, or reading of Numbers I adviſe the Learner (in the firſt place) to get by heart the uppermoſt Column of the foregoing Table, ſo that he may readily run back (from the Right-hand towards the Left) by *Units*, *Tens*, *Hundreds*, &c. Then let him practiſe upon three or four of the firſt Figures (next the Right-hand) in all the ſix Examples, till he can read them perfectly. Thus the four firſt Figures of the firſt Example are to be read; *One Thouſand Two Hundred Thirty Four*; the four firſt of the ſecond Example are to be read, *Five thouſand Six hundred and Seventy*; the four firſt of the third Example are, *Eight thouſand Nine hundred*; and ſo of the reſt, as the Table plainly ſhews: for the Value of every Figure (according to the Place he ſtands in) is written over him.

Being perfect in reading four Figures, you may proceed to five, ſix, ſeven, eight, and nine; which when you can once read perfectly, you may as eaſily read a hundred, if you do but make a Point under every ſeventh Figure incluſively; (namely under the ſeventh, the thirteenth, the nineteenth, *&c.*) and repeat the Word *Millions* ſo often as there are Points remaining. Thus, the firſt Example in the foregoing Table is, *One Million Millions, two hundred thirty four thouſand five hundred ſixty ſeven Millions, eight hundred ninety one thouſand two hundred thirty four.*

When you can diſtinctly read any Number in the foregoing Table, then write down any Sum or Number of Figures that comes firſt in your Mind, and practiſe to read them Do thus, till you

you find that you can readily and diſtinctly read any Number that ye ſee written down: For he that learns the following *Rules* of Arithmetick without being perfect in *this* of *Numeration*, were as good learn nothing; for, when he has caſt up a Sum, or anſwer'd a Queſtion in Arithmetick, he can give no Account of it: As for Inſtance; If he were requir'd to find how many Minutes it is ſince the Creation of the World, which is very eaſily done; but when he has done it, if he be ask'd How many they are? He can only ſay, *Look ye there, ſo many*; but he can't tell you how many; ſo that he were as good *ſay nothing*; and it had been as well if he had *done nothing*. So that you ſee, all the following *Rules* are of no Uſe without *this*.

VII. This Method of reading Numbers (taught in the foregoing Section of this Chapter) is the moſt ancient Method, and is ſtill moſt in Uſe amongſt common Arithmeticians. But if the Number of Places exceed 13 or 19, (ſo that the Word *Million* comes to be repeated more than 2 or 3 times) a Number this way expreſt is perfectly unintelligible; no Man being able to conceive what kind of Number it is. And therefore, to remedy this Inconveniency, our beſt modern Arithmeticians have invented ſeveral other ways of reading of Numbers: But theſe being of moſt Uſe to thoſe that have made ſome Proficiency in the Mathematicks, (and ſo have occaſion for larger Numbers than any in our Table) I ſhall omit them in this Place.

VIII. When you can readily and exactly read any Number, you may then proceed to the *Second Part of Numeration*; which teaches us, *How to ſet down in Figures any Number propos'd.*

This part of Numeration, all Authors have hitherto omitted; yet herein a little Practice will make

make you perfect, if you do but observe the following Particulars: Namely,

First, You must take Notice what Denominations are wanting in any Number propos'd, and supply those places with Cyphers: And you may pretty easily know what Denominations are wanting, because they are commonly supply'd by the Word *and*; as in these Examples.

How do you set down *One thousand Seven hundred and Nine?* Here the Denomination of *Tens* is wanting, (and in the Proposal is supply'd by the Word *and*) which must therefore (in setting it down) be supply'd with a Cypher; for it must be set down thus, 1709. Again,

How do you set down *Two thousand and Ninety seven?* Here the Denomination of *Hundreds* is wanting; which must therefore be supply'd with a Cypher; for it must be set down thus, 2097,

Secondly, Be sure to set no more than 9 in any Denomination, tho' the Number be otherwise proposed; as in this Example:

How do you set down *Eleven thousand Eleven hundred and Eleven?* This Example many Learners would set down thus, 111111, which is false; for it is *One hundred and Eleven Thousand, One hundred and eleven.* But here you must consider, that *Eleven hundred* is *One thousand One hundred*; so that the Number propos'd is properly, *Twelve thousand One hundred and Eleven*, and must be set down thus, 12111. Again,

Let it be required to set down *Eleven millions eleven hundred and eleven thousand eleven hundred and eleven*: which Number is properly *Twelve millions one hundred and twelve thousand one hundred and eleven*; and must be set down thus, 12112111.

Also, Let it be requir'd to set down *a Million wanting one*; which must be done thus, 999999.

A little

A little Practice will make this part of Numeration perfect; especially if you are first perfect in the former Part of this Rule; for by *that* you may easily prove whether you have set down any Number truly or not; and therefore I shall conclude this Rule with a few Examples more for the Learners Practice to set down in Figures.

*Examples of Number for to exercise the Learner to set down in Figures.*

Nineteen.
Twenty nine.
Four hundred Ninety seven.
Seven thousand and Twenty nine.
Forty two thousand Three hundred.
Nine hundred Seventy five thousand.
Two Millions Fifty seven thousand Three hundred Ninety four.
Ninety nine millions Seven hundred forty two thousand Eight hundred Twenty four.
Five hundred thirty seven millions Eight hundred forty two thousand and Ninety nine.
Twenty millions.
Seven hundred thousand.

---

## CHAP. III.

### *Of ADDITION.*

ADdition is *that* Rule of Arithmetick which teaches how to bring *two* (or more) *Numbers* into *one*; call'd the Sum or *Aggregate*. As if 8 and 9 were given to be added together, their Sum will be 17; and the Sum of 6 and 4 is 10.

II. *Addition* is of two kinds; namely, Simple or *Absolute*, and Compound or *Respective*.

III. Simple or *Absolute Addition* is the adding or bringing together of two (or more) Numbers, whereof we consider only the bare Numbers, without any respect or regard to any thing else; (as if I would add together 12 and 24, their Sum is 36) or at least the Numbers given to be added together are all of Kind, Name, or Denomination, (as Men, Pounds, Ships, Trees, *&c.*) And this part of Addition is perform'd after this manner.

IV. Set the Numbers (to be added together) orderly one under another; that is to say, set Units under Units, Tens under Tens, Hundreds under Hundreds, Thousands under Thousands, *&c.* For Instance.

Let it be required to add together, 434120 and 36972, and 87654, and 46993; they must be placed one under another, thus:

| | | | | |
|---|---|---|---|---|
| Units. | 0 | 2 | 4 | 3 |
| Tens. | 2 | 7 | 5 | 9 |
| Hundreds. | 1 | 9 | 6 | 9 |
| Thousands. | 4 | 6 | 7 | 6 |
| Tens of Thousands. | 3 | 3 | 8 | 4 |
| Hundreds of Thous. | 4 | | | |

The Numbers being rightly placed as you see above, then draw a Line under them; and so are they fit for Operation. Then beginning with the first File [or Row] of Figures next the Right hand, add them together, and set down the odd Digits (if any be) of their Sum directly under the File, and carry the Articles [or Tens] (if any be) in your Mind to the next File; which second File (together with what you carry'd in your Mind) add also into one Sum, setting down the

Digi-

Digits (if any be) of their Sum directly under *that* File, and carrying the Articles (if any be) to the next or third File; and so proceed in the same manner till all be added: Still observing to set down the odd ones (above Ten or Tens) of the Sum of each File directly under that File; and carrying the Articles (or Tens) as so many Ones to the next File.

*Example.*

| | |
|---|---|
| What is the Sum of these four Numbers? | 434120 |
| | 36972 |
| | 87654 |
| | 46993 |
| Sum | 605739 |

Here I begin, and Work thus. I say, 3 and 4 is 7, and 2 is 9; which I set down under the first File. Then I go to the next File, saying, 9 and 5 is 14, and 7 is 21, and 2 is 23; 3 and go 2; [that is, I set down 3, and carry 2 to the next Place.] Then I go to the 3d File, saying, 2 that I carry and 9 is 11, and 6 is 17, and 9 is 26, and 1 is 27; 7 and go 2; [that is, I set down 7, and carry 2 to the next Place.] Then I go to the 4th File, saying, 2 that I carry and 6 is 8, and 7 is 15, and 6 is 21, and 4 is 25; 5 and go 2; [that is, I set down 5, and carry 2 to the next Place.] Then I proceed to the 5th File, saying, 2 that I carry'd and 4 is 6, and 8 is 14, and 3 is 17, and 3 is 20; 0 and go 2; [that is, I set down 0, and carry 2 to the next Place.] Then I go to the last File, saying, 2 that I carry'd and 4 is 6; which I set down. And so the Work is finish'd.

Note, 1. That when you come to the last File, you must always set down the whole Sum of that File, let it be what it will: As in this Example.

Num.

Numbers to be added, $\begin{cases} 984721 \\ 643268 \\ 472673 \\ 298654 \end{cases}$

Sum 2399316

Note, 2, That if one of the Numbers to be added consist of more Figures than the rest, those Figures must be brought down, and set down with the rest of the Sum; as in this Example.

Numbers to be added, $\begin{cases} 6876432 \\ 12463 \\ 7896 \\ 4327 \end{cases}$

Sum 6901118

This is the whole Art of Addition of Absolute Numbers; which if well observ'd, you cannot easily miss of adding up a Sum right; I shall therefore only add a few Examples more for the Learner's Practice, and proceed to the other part of Addition.

*More Examples for the Learners Practice.*

| *Men.* | *Sheep.* | *Oxen.* |
|---|---|---|
| 7492 | 742 | 7654 |
| 4274 | 178 | 1745 |
| 6727 | 427 | 4272 |
| 1749 | 174 | 274 |
| 174 | 427 | 17 |
| 65 | 174 | 2 |

*Questi-*

*Questions to exercise the Learner in Addition of Numbers of one Name.*

*Quest.* 1. Suppose a Merchant hath in Money five thousand Pounds, in Diamonds to the Value of eight hundred and fifty Pounds, in Plate to the Value of two hundred and forty Pounds, in several Sorts of Goods to the Value of seven thousand Pounds, in Estate ten thousand Pounds; What is the Merchant worth in all?

*Answer*, 23090 Pounds.

*Quest.* 2. If the King hath in *Flanders* thirty thousand Men, in *Germany* fifteen thousand Men, in *Spain* twelve thousand seven hundred Men, in *Portugal* nine thousand eight hundred Men, in the Navy fourteen thousand nine hundred Men, in *Great Britain* nine thousand five hundred Men; How many Men are there in all in his Majesties Service? *Answer*, 91900 Men.

*Compound* or *Respective Addition*, is the bringing into one Sum several Numbers of different Denominations [or Names] as Pounds, Shillings, and Pence; or, Pounds, Ounces and Drams; or, Yards, Quarters, and Nails, *&c.*

This part of *Addition* is perform'd by this plain and general Rule,

Set the Numbers (to be added together) one under another, in such Order that each Denomination may stand under his like; as, Pounds under Pounds, Shillings under Shillings, Pence under Pence; and so of any other Denomination, as *Weights*, *Measure*, *Time*, &c. Then (having drawn a Line under them) begin at the least Denomination, (*viz.* the File or Row of Figures next the Right-hand) and add them into one Sum; and having so done, consider how many of that Denomination goes to make one of the next greater Denomi-

Denomination, and ſet down the odd ones, carrying ſo many to the next File, as their Sum made Units in the firſt File.

As for Example, in adding of Money: for every 4 in the Farthings you muſt carry 1 to the Pence (becauſe every 4 of the Farthings make a Penny;) for every 12 in the File of Pence carry 1 to the File of Shillings, (becauſe every 12 Pence is a Shilling; and for every 20 contain'd in the File of Shillings, carry 1 to the Pounds, (becauſe 20 Shillings is a Pound:) And the odd Farthings, Pence, and Shillings muſt be ſet down in their proper Places under the Line, as is done in the following Examples. Underſtand the ſame of any other Denomination; as, Weights, Meaſures, Time, and the like. For this is all the Difference between *Abſolute* and *Reſpective Addition.*

> *Addition* Abſolute *the Tens doth carry;*
> Reſpective, *as Denominations vary.*

I ſhall Illuſtrate this Rule by Examples in all the ſeveral kinds of Compound or Reſpective Addition moſt in Uſe beginning with

## *Addition of Money.*

And here, becauſe there are two ways of Caſting-up Sums of Money in Uſe, (namely, the *London-way* and the *Country-way*) I believe it will not be amiſs if I treat of them both; which I ſhall do with as much Plainneſs and Brevity as poſſible. But before I proceed, you muſt note,

1. That 4 Farthings make a Penny, 12 Pence a Shilling, and 20 Shillings a Pound Sterling, or *Engliſh* Money.

2. That over our Accounts we generally write *li.* for (*Libri*) Pounds, *s.* for (*Solidi*) Shillings, *d.* for (*Denarii*) Pence, and *q.* for (*quadrantes*) Farthings.

But

But the Marks of Farthings are more commonly thus:

$\frac{1}{4}$ For one Farthing.
$\frac{1}{2}$ For two Farthings.
$\frac{3}{4}$ For three Farthings.

Having premis'd this, I begin with the first, or *London Way*, which is done by the help of the following Table, which must be got by heart.

The Table of Pence.

| *d.* | | *s.* | *d.* | |
|---|---|---|---|---|
| 20 | is | 1 | 8 | |
| 30 | | 2 | 6 | |
| 40 | | 3 | 4 | |
| 50 | | 4 | 2 | |
| 60 | | 5 | 0 | or a Crown. |
| 70 | | 5 | 10 | |
| 80 | | 6 | 8 | or a Noble. |
| 90 | | 7 | 6 | |
| 100 | | 8 | 4 | |
| 110 | | 9 | 2 | |
| 120 | | 10 | 0 | or an Angel. |
| 130 | | 10 | 10 | |
| 140 | | 11 | 8 | |
| 150 | | 12 | 6 | |
| 160 | | 13 | 4 | or a Mark. |

After the Table of Pence being got by heart, then suppose the following Sums were given to be added together: *viz.*

225 *l.* 07 *s.* 08 *d* $\frac{1}{4}$, and 174 *l.* 12 *s.* 10 *d.* $\frac{1}{2}$, and 74 *l.* 06 *s.* 05 *d.* $\frac{3}{4}$, and 142 *l.* 10 *s.* 07 *d.* $\frac{1}{4}$, and 21 *l.* 09 *s.* 04 *d.*

The Numbers being placed according to Order, as before directed, will stand thus:

225

| l. | s. | d. |
|---|---|---|
| 225 | 07 | 08 $\frac{1}{4}$ |
| 174 | 12 | 10 $\frac{1}{2}$ |
| 274 | 06 | 05 $\frac{3}{4}$ |
| 142 | 10 | 07 $\frac{1}{4}$ |
| 421 | 09 | 04 |

I begin with the leaſt Denomination or File of Farthings, ſaying, $\frac{1}{4}$ and $\frac{3}{4}$ is 4, and $\frac{1}{2}$ is 6, and $\frac{1}{4}$ is 7 Farthings; which I conſider makes 1 Penny and 3 Farthings; wherefore I put down 3 Farthings under the Farthings, and carry the Penny to the next Row or Place of Pence, ſaying, 1 that I carried and 4 is 5, and 7 is 12, and 5 is 17, and 10 is 27, and 8 is 35 Pence; which (by the Help of the foreſaid Table of Pence) I conſider makes 2 Shillings and 11 Pence: wherefore I put down 11 under the Row of Pence, and and carry the 2 Shillings to the next Row or Place of Shillings, ſaying, 2 that I carried and 9 is 11, and 10 is 21, and 6 is 27, and 12 is 39, and 7 is 46 Shillings; which I conſider makes 2 Pounds 6 Shillings: wherefore I put down 6 under the Row of Shillings, and carry the 2 Pounds to the firſt Row of Pounds, ſaying, 2 that I carried and 1 is 3, and 2 is 5, and 4 is 9, and 4 is 13, and 5 is 18: wherefore I ſet down 8 under the firſt Row of Pounds, and carry 1 to the ſecond Row of Pounds, ſaying, 1 that I carried and 2 is 3, and 4 is 7, and 7 is 14, and 7 is 21, and 2 is 23; wherefore I ſet down 3 under the ſecond Row of Pounds, and carry 2 to the third and laſt Row, ſaying, 2 that I carried and 4 is 6, and 1 is 7, and 2 is 9, and 1 is 10, and 2 is 12; wherefore I ſet down 12, becauſe it is the Sum of the laſt Row. And ſo the whole Work is done: And the Sum appeareth to be as followeth.

| li. | s. | d |
|---|---|---|
| 225 | 07 | 08 $\frac{1}{4}$ |
| 174 | 12 | 10 $\frac{1}{2}$ |
| 274 | 06 | 05 $\frac{3}{4}$ |
| 142 | 10 | 07 $\frac{2}{4}$ |
| 421 | 09 | 04 |
| Sum 1238 | 06 | 11 $\frac{3}{4}$ |

*Note*, once for all in adding up the last, (or eatest) Denomination of any Sum in Respective Compound Addition, whether it be in Money, eight, Measure, *&c.* you must always carry the ns as in Absolute or Simple Addition.

I shall now proceed to shew you the other way Addition of Money, for the doing of which e this Example.

*Example.*

A Tradesman brings in his Bill to a Gentleman, erein are the following particular Sums; What he whole Sum of this Bill?

| l. | s. | d. | q. |
|---|---|---|---|
| 4 | 16 | 11 | 2 |
| 3 | 14 | 10 | 1 |
| 5 | 10 | 09 | 3 |
| 2 | 19 | 06 | 2 |
| 6 | 13 | 08 | 1 |
| 2 | 12 | 10 | 2 |
| 1 | 09 | 09 | 3 |
| 2 | 16 | 16 | 0 |
| 3 | 18 | 08 | 2 |
| 2 | 10 | 10 | 1 |
| 1 | 09 | 09 | 2 |
| 38 | 14 | 04 | 3 |

Thus I begin with the File (or Column) of things, saying, 2 and 1 is 3 and 2 is 5, which kes 1 penny and 1 farthing over; wherefore I

make a Point or Speck against the 2 and carry on the 1 farthing, ſaying, 1 and 3 is 4, which makes another Penny, wherefore I make a Point against 3, and proceed, ſaying, 2 and 1 is 3 and 2 is 5, which makes another Penny and 1 Farthing over, I make a Point against 2, and carry on the 1 farthing, ſaying, 1 and 3 is 4, which makes another Penny; wherefore I make a Point against 3, and go on, ſaying, 1 and 2 is 3, (which not amounting to a Penny) I ſet down under the Line; but the Pence that amounted of the Sum of the Farthings I carry to the File of Pence: Wherefore I look how many Points I have in the Farthings (which are 4) for ſo many Pence have I to carry to the File of Pence; Then I go to the File of Pence, ſaying, 4 *d.* that I carry and 9 *d.* is 13 *d.* that is 1 *s.* and 1 *d.* wherefore I make a Point against 9, and carry on the 1 *d.* ſaying, 1 *d.* and 10 *d.* is 11 *d.* and 8 *d.* is 19 *d.* that is 1 *s.* and 7 *d.* wherefore I make a Point against 8, and carry on the 7 *d.* to the next Figure. In the ſame manner I proceed (ſtill making a Point against the Figure where it amounts to a Shilling) till I have caſt up the whole File of Pence, where I find at laſt 4 odd Pence, which I write under the Line: Then I look how many Points I have in the Pence, which are 8; wherefore I carry 8 to the File of Shillings, adding up firſt the Units of Shillings, and making a Point wherever it amounts to 20; and in adding up this File, I find 4 odd Shillings, which I ſet down under the Line: Then I go to the Tens of Shillings, and (becauſe every 2 of them make a Pound) I make a Point against every 2 of them, and in the end I find an odd one, which I ſet down alſo under the Line: Then I ſee how many Points I have on both ſides the Shillings, and they are 7; wherefore I carry 7 to the File of Pounds, which

I add

add up as in Addition of Absolute Numbers; nd so the whole Sum appears to be 38 *l.* 14 *s.* *d.* 3 *q.*

I have been so large in shewing how to work hese Examples both ways, that I think it needless o say any more on this Head. I shall therefore nly add a few Examples for the Learner's Practice, eaving him to work them himself; only I shall add ere and there a Note, as occasion requires.

*Example.*

A Steward gathering up Rents for his Lord has eceiv'd of several Men, A, B, C, D, E, F, G, he following Sums: How much has he receiv'd n all?

| | | *lib.* | *s.* | *d.* |
|---|---|---|---|---|
| Receiv'd of | *A.* | 450 | 19 | 06 |
| | *B.* | 362 | 12 | 03 |
| | *C.* | 244 | 13 | 04 |
| | *D.* | 210 | 10 | 06 |
| | *E.* | 116 | 16 | 08 |
| | *F.* | 64 | 14 | 09 |
| | *G.* | 40 | 10 | 06 |
| Answer | | 1490 | 17 | 06 |

*A Bill of House Expences to exercise Addition.*

| | | *l.* | *s.* | *d.* |
|---|---|---|---|---|
| 1715 *March* 9 | Paid for a Book to keep these Accounts | 00 | 01 | 04 |
| | Wine and Oysters | 00 | 05 | 06 |
| 12 | Bread and Cheese | 00 | 02 | 04 |
| | Butter and Eggs | 00 | 01 | 02 |
| | Half a Peck of Flower | 00 | 00 | 08 |
| 15 | Beef and Mutton | 00 | 06 | 02 |
| | Two Dozen of Candles | 00 | 14 | 04 |
| | Roots and Herbs | 00 | 00 | 08 |
| | Drinking Glasses. | 00 | 02 | 04 |

 Gave

| | | l. | s | d |
|---|---|---|---|---|
| *Mar.* 27 | Gave to New Bedlam | 00 | 00 | 02 |
| | Veal and Bacon | 00 | 04 | 06 |
| | Paid the Taylor's Bill | 03 | 16 | 00 |
| | A Hood and Furbelow Scarf | 03 | 15 | 06 |
| | A Suit of Knots and Gloves | 00 | 06 | 00 |
| *April* 2 | Fish and Anchovies | 00 | 01 | 04 |
| | Gave the Poor | 00 | 00 | 06 |
| | Paid the Butchers Bill | 02 | 10 | 04 |
| | Oatcakes and Wheat | 00 | 01 | 04 |
| | Brandy and Lemons | 00 | 04 | 06 |
| 6 | Paid a Quarter's Rent | 05 | 15 | 00 |
| | Sugar and Nutmeg | 00 | 01 | 02 |
| | Gave at a Christning | 00 | 05 | 00 |
| 9 | A Pair of Stockings and Shoes | 00 | 09 | 06 |
| | A Chaldron of Coals | 01 | 16 | 00 |
| | Paid the Draper's Bill | 07 | 10 | 04 |
| | Veal Pork and Tripe | 00 | 10 | 06 |
| | Coffee and Tea | 00 | 12 | 04 |
| 15 | Salt, Vinegar and Pepper | 00 | 05 | 04 |
| | A Bushel of Meal | 00 | 05 | 06 |
| | A Quarters Wages to the Maid | 01 | 00 | 00 |
| | Soap and Fuller's Earth | 00 | 00 | 06 |
| | Three Quarts of Wine | 00 | 06 | 00 |
| 27 | Ten Bushels of Malt | 01 | 10 | 6 |
| | Hops and Yest | 00 | 03 | 06 |
| | Brewing | 00 | 01 | 06 |
| 29 | Fowls, Bacon and Sprouts | 00 | 07 | 08 |
| | Lobsters and Crabs | 00 | 02 | 02 |
| | A Cheshire Cheese | 00 | 8 | 04 |
| | To the Minister | 00 | 05 | 00 |
| | Pork and Peas | 00 | 02 | 02 |
| *May* 2 | To a Physician | 00 | 10 | 00 |
| | To the Apothecary | 00 | 05 | 04 |

A

*A Grocer's Bill of small Parcels to exercise Addition.*

*Mr.* Longwinded *Dr. to* John Trustwell, *Grocer.*

| 1715 | | l. | s. | d. |
|---|---|---|---|---|
| *March* 4 | For one Pound of Sugar | 0 | 00 | 10 |
| | Two Ounces of Cloves | 0 | 00 | 08 $\frac{1}{2}$ |
| 5 | Four Pound of Sugarcandy | 0 | 04 | 4 |
| | Half a Pound of Rice | 0 | 00 | 04 $\frac{1}{2}$ |
| 12 | One Ounce of Mace | 0 | 00 | 07 $\frac{1}{2}$ |
| | One Sugar-loaf | 0 | 02 | 6 |
| | One Ounce of Ginger | 0 | 00 | 04 $\frac{3}{4}$ |
| *April* 7 | Half a Pound of Currants | 0 | 00 | 05 |
| | One Pound of Tobacco | 0 | 02 | 04 |
| 15 | Half a Pound of Raisins | 0 | 00 | 03 $\frac{1}{4}$ |
| | Two Ounces of Nutmegs | 0 | 01 | 04 $\frac{1}{2}$ |
| 28 | One Ounce of *Jamaica* Pepper | 0 | 00 | 02 $\frac{1}{4}$ |
| | Two Pound of Figgs | 0 | 00 | 07 |
| 30 | Half an Ounce of All-spice | 0 | 00 | 01 $\frac{1}{2}$ |
| | Total | 0 | 15 | 0 $\frac{3}{4}$ |

*Note*, To set down a Sum in right Form and Order, is as necessary as to add them up right when set down: It may not therefore be amiss to propose a Question of this Nature to exercise the Learner therein.

*Example.*

Suppose I am indebted to A, two hundred ninety four Pounds, ten Shillings, and ten Pence; to B, five hundred forty nine Pounds, fourteen Shillings, and three Pence; to C, three hundred Pounds, eight Shillings, and eight Pence; to D, seven hundred ninety nine Pounds, twelve Shillings, and six Pence; and to E, ninety four Pounds, sixteen Shillings, and nine Pence: What am I indebted in all?

*Answ.* 2039 *l.* 03 *s.* 00 *d.*

Having obſerv'd that there are ſeveral Sum which, in common way of ſpeaking, are expreſ after a quite different manner from the way they a wrote down; I thought it not improper to exe ciſe the Learner in them, that he may not be ( ſome are) at a loſs how to ſet down properly an thing of this Nature, which may happen in his wa

I ſhall propoſe the Example by way of a Bill Disburſement, as followeth:

*Example.*

Laid out in Lamb, eight Groats.
In a Sallet, ſeven Farthings.
In a Cheeſe, two and twenty Pence.
In Butter and Eggs, fifteen Pence.
In Bread, ninteen Pence half penny.
In Pepper and Vinegar, three half pence.
In Shoes, eleven Groats and two Pence.
In a Chaldron of Coals, ſix and thirty Shilling
In ſeveral other things to the Sum of ſeven an fifty Shilings.
What does the whole amount to?

*Anſw.* 5 *l.* 04 *s.* 05 *d*

Thus have I done with Addition of Money; ſhall now go on to the ſeveral Weights and Me ſures, which are done after the ſame manner Pounds, Shillings, and Pence; only obſerving th Notes, and conſider how many of one Denomin tion goes to make one of the next bigger Denom nation, and ſo to point and carry accordingly.

## *Addition of* Averdupois Weight.

*Note* 1. That 16 Drams make an Ounce, Ounces a Pound, 28 Pound a Quarter of a Hu dred, 4 Quarters of a Hundred are a Hundr Weight, and 20 Hundred a Tun.

*Note* 2. The Marks or Characters by which th Weight is commonly expreſt, are theſe, *viz.* T. f

Tun

Tuns, *C.* for Hundreds, *Qr.* for Quarters of a Hundred, *lb.* for Pounds, *oz.* for Ounces, and *dr.* for Drams.

*Example* 1. *Of Avoirdupois Great Weight.*

| *T.* | *C.* | *qr.* | *lb.* |
|---|---|---|---|
| 2 | 18. | 3. | 27. |
| 1 | .16 | 2 | 20. |
| 2 | 14 | 1 | 12 |
| 1 | .12 | 3. | 10. |
| 2 | 10 | 2. | 18 |
| 1 | 09. | 0 | 20. |
| 2 | 08 | 3. | 16 |
| 15 | 11 | 2 | 11 |

*Exam.* 2. *Of Avoirdupois Small Weight.*

| *l.* | *oz.* | *dr.* |
|---|---|---|
| 8 | 15. | 15. |
| 7 | 12 | 10 |
| 6 | 10. | 12, |
| 4 | 08 | 09 |
| 3 | 13. | 14 |
| 31 | 13 | 12 |

*Note* 3. In the first Example of Avoirdupois Weight, the Pounds are pointed at 28, the Quarters at 4, and the Hundreds at 20. And in the second Example, the Drams are pointed at 16, and the Ounces at 16. In your Addition, carry the Points of one Row to the other, because they make so many of the next Denomination. The same Method of Pointing is to be observ'd in all the rest of the Examples following, according to the Notes laid down.

*Note* 4. By Avoirdupois Weight are commonly weighed Butter, Cheese, Wax, Tallow, Flesh, Pitch, Rozen, Lead, Iron, all sorts of Grocery Wares, and all such kind of Garble whence there may issue a Waste.

*Note* 5. A Pound Avoirdupois, (containing 16 Ounces) is equal to 14 Ounces, 12 Penny-weight, Troy-weight.

*Note* 6. Wool is also weighed with the Avoirdupois-weight: Thus for Wool, 7 Pounds is a Clove, 2 Cloves is a Stone, 2 Stone a Tod, 6 Tods and a half a Wey, and 12 Sacks a Last.

## XI. *Addition of* Troy-Weight.

*Note* 1. That 24 Grains make a Penny-weig 20 Penny-weight an Ounce, and 12 Ounces Pound Troy-weight.

Note 2. The Characters or Marks by which Troy weights are commonly noted, are, *lb.* for Pound *oz.* for Ounces, *dw.* for Penny-weights, and *gr.* f Grains.

The *gr.* are pointed at 24, the *dw.* at 20, the *oz.* at 12, set down and carry as before.

*Example.*

| *lb.* | *oz.* | *dw.* | g |
|---|---|---|---|
| 14 | 11. | 19. | 23 |
| 12 | 10. | 15. | 20 |
| 10 | 09 | 10. | 06 |
| 8 | 06. | 03 | 09 |
| 6 | 04 | 12 | 14 |
| 53 | 07 | 02 | 00 |

*Note* 3. By Troy-weight are weighed Bre Gold, Silver, and Electuaries.

Note 4. The Pound Troy (consisting of 1 Ounces) is equal to about 13 Ounces 2 Dra and a half, Avoirdupois.

## XII. *Addition of* Apothecaries Weights.

*Note* 1. Apothecaries Weights are the Tro Pound, but differently divided; for with them 2 Grains make a Scruple, 3 Scruples a Dram, 8 Dra an Ounce, and 12 Ounces a Pound.

*Note* 2. The Characters or Marks whereby Apo thecaries Weights are commonly noted, are, ℔ for Pounds; ℥ for Ounces; ʒ for Drams ℈ f Scruples; and *gr.* for Grains.

*Example.*

The *gr.* are pointed at 20, the ℈ at 3, the ʒ at 8, the ℥ at 12, *&c.*

| ℔ | ℥ | ʒ | ℥ | gr. |
|---|---|---|---|---|
| 4 | 10 | 7. | 2 | 19 |
| 3 | 10. | 6. | 1. | 10 |
| 2 | 09. | 5 | 0 | 06 |
| 1 | 08. | 4. | 2 | 04 |
| 1 | 06 | 3 | 1. | 12 |
| 14 | 11 | 3 | 2 | 11 |

*Note*

## XIII. *Addition of* Liquid Measure.

Note, 2 Pints make a Quart, 2 Quarts a Pottle, 2 Pottles a Gallon, 8 Gallons a Firkin of Ale, 9 Gallons a Firkin of Beer, 2 Firkins a Kilderkin, 2 Kilderkins a Barrel, 18 Gallons and a half a Runlet; 42 Gallons a Tierce or third part of a Pipe or Butt; 63 Gallons a Hogshead, 2 Hogsheads a Pipe or Butt, and 2 Pipes or Butt a Tun.

| *Of Wine.* | | | | *Examples of Beer,* | | | *Of Ale.* | | |
|---|---|---|---|---|---|---|---|---|---|
| *T.* | *hhds.* | *gal.* | *Pts.* | *Bar.* | *fir.* | *gall.* | *Bar.* | *fir.* | *gall.* |
| 37 | 3. | 18 | 5. | 7 | 3. | 8. | 6 | 1. | 7. |
| 38 | 2. | 24. | 0 | 5 | 1 | 4 | 5 | 1 | 4 |
| 67 | 1 | 20 | 6. | 5 | 2 | 6. | 4 | 0 | 3 |
| 38 | 2. | 17 | 7. | 6 | 1. | 7. | 4 | 2 | 7 |
| 79 | 0 | 47. | 3 | 5 | 3 | 6 | 6 | 3. | 1. |
| 64 | 1 | 52 | 4 | 6 | 1. | 2 | 5 | 2. | 7 |
| 335 | 3 | 46 | 1 | 37 | 2 | 6 | 33 | 0 | 5 |

## XIV. *Addition of* Dry-Measure.

Note, In Dry Measure, 2 Pints make a Quart, 2 Quarts a Pottle, 2 Pottles a Gallon, 2 Gallons a Peck, 4 Pecks a Bushel, 8 Bushels a Quarter, 4 Quarters a Chaldron, and 5 Quarters a Way: But 36 Bushels is a Chaldron of Sea-Coal in *London*.

*Example.*

| *Chal.* | *qrs.* | *Bush.* | *Peck.* |
|---|---|---|---|
| 148 | 3. | 6. | 3. |
| 37[illegible] | 1 | 7. | 2 |
| 296 | 2. | 4 | 3. |
| 128 | 1 | 5. | 0 |
| 94 | 0 | 5. | 2. |
| 38 | 2. | 4 | 3 |
| 1082 | 1 | 2 | 3 |

The *Peck* are pointed at 4, the Bush. at 8, the *qrs.* at 4, *&c.*

## XV. *Addition of* Long-Measure.

*Note*, That 3 Barley-corns make an Inch, 1[2] Inches a Foot, 3 Foot a Yard, 3 Foot and 9 Inch[es] an Ell, 6 Foot a Fathom, 16 Foot and a half [a] Statute Pole or Perch, 40 Perches a Furlong, an[d] 8 Furlongs a Mile.

*Example.*

The *Per.* are pointed at 40, the *Furl.* at 8.

| *Mil.* | *Furl.* | *Per.* |
|---|---|---|
| 48 | 7. | 24. |
| 37 | 3 | 18 |
| 65 | 5. | 28. |
| 36 | 5 | 00 |
| 20 | 6. | 20 |
| 209 | 4 | 10 |

## XVI. *Addition of* Cloth-Measure.

*Note*, That 2 Inches and a Quarter make [a] Nail, 4 Nails make a quarter of a Yard, 3 qua[r]ters of a Yard make an Ell *Flemish*, 4 quarters [a] Yard *English*, and 5 quarters of a Yard, or 45 I[n]ches, is an Ell *English*,

*Example* 1.

| *Yds.* | *qrs.* | *na.* |
|---|---|---|
| 16 | 3. | 3. |
| 14 | 2 | 1 |
| 12 | 1. | 2. |
| 10 | 3 | 1 |
| 9 | 2. | 2. |
| 8 | 3. | 3 |
| 73 | 1 | 0 |

*Exam.* 2.

| *Ells* | *f. q.* | *na.* |
|---|---|---|
| 27 | 2. | 3. |
| 47 | 1 | 2 |
| 15 | 2. | 3. |
| 67 | 8 | 2. |
| 56 | 1. | 1 |
| 17 | 2. | 2 |
| 232 | 0 | 1 |

*Exam.* 3

| *Ells* | *En. q.* |
|---|---|
| 12 | 4. |
| 61 | 2 |
| 47 | 2. |
| 51 | 1 |
| 5 | 4. |
| 7 | 1. |
| 186 | 1 |

In the 1 Example the *Na.* are pointed at 4, t[he] *qurs.* at 4, &c.

*Ex.* 2. The *Na.* are pointed at 4, the *qrs.* at 3, &[c.]

*Ex.* 3. The *Na.* are pointed at 4, the *qrs.* at 5, &[c.]

XVII. *Ad[dition]*

## XVII. *Addition of* Land-Measure.

*Note*, 40 Square Poles or Perches make a Rood, or quarter of an Acre, and 4 Roods make and Acre.

*Example.*

| *Acr.* | *Rood.* | *Per.* | |
|---|---|---|---|
| 120 | 2 | .34 | The *Per.* are |
| 275 | 3. | 14 | pointed at 40, |
| 162 | 1 | 35 | the *Roods* at |
| 98 | 2. | 20 | 4, &c. |
| 47 | 3 | .30 | |
| 64 | 1. | 15 | |
| 769 | 3 | 28 | |

## XVIII. *Addition of* Time.

*Note*, 60 Minutes make an Hour, 24 Hours a Day, 365 Days a Year.

*Example.*

| *Da.* | *Ho.* | *Mi.* | |
|---|---|---|---|
| 20 | 23. | .59 | The *Mi.* are |
| 16 | 20. | .40 | pointed at 60, |
| 14 | 16 | 36 | the *Ho.* at 24, |
| 12 | 14. | .28 | &c. |
| 10 | 18. | 12 | |
| 8 | 16 | 16 | |
| 84 | 14 | 11 | |

The best Proof of Addition is to add it up again; (for the Old Proof by casting a way the 9's, of separating it in two parts, as taught by some, is not at all used in Business; ) I commonly add it once

once upards and once downwards, and if they agree, I conclude it right; but if they do not agree, I add it over again both ways till I make them agree.

# CHAP. IV
## Of SUBTRACTION.

I SUbtraction is that Rule which teaches how to take a *lesser Number* out of a *greater*, to find their Difference, or how much one of the two given Numbers is bigger than the other.

II. Of the two given Numbers, the lesser Number is call'd the *Subtrahend*, [or Number to be subtracted] and the greater Number is call'd the *Minorand*, [or Number to be made less] and the Difference of the two Numbers is call'd the *Remainder*.

Thus, If I would subtract (or take) 12 out of 16, there would remain 4; in which Example 12 is the *Subtrahend*, 16 is the *Minorand*, and 4 is the *Remainder*.

III. Subtraction is also of two kinds, namely Simple or Absolute, and Compound or Respective.

IV. *Simple* or *Absolute Subtraction*, is the Subtraction of Simple or Absolute Numbers; (what they are, has been shewn above in Chap. III.) and is perform'd by this Rule:

Set the lesser Number under the greater, in such order that Units may stand under Units, Tens under Tens, *&c.* as in Addition. Then (having drawn a Line under them) begin at the Right hand, and take the first Figure of the Subtrahend (or under Number) out of the first Figure of the Minorand, (or upper Number) and set the

Re-

Remainder (exactly under him) under the Line: Then go to the second Figure, (or place of Tens) of the Subtrahend, and take it likewise from the Figure over it, setting the Remainder under it, as before. Do the same by all the rest of the Figures; so the Number under the Line will be the Remainder,

*Example.*

Let it be requir'd to substract (or take) 21 from 49: Or, how much is 49 bigger than 21?

Here I set down the given Numbers as directed above, setting 21 under 49, and drawing a Line under them: Then I begin at the Place of Units, saying, 1 from 9 and there remains 8, which I set (under 1) underneath the Line; and proceed to the next place, saying, 2 from 4 and there remains 2, which I also place under the Line. So the Work is finished; and I find the Remainder (or Difference betwixt 21 and 49) is 28: As you may see by the Work in the Margin.

$$\begin{array}{r} 49 \\ 21 \\ \hline 28 \end{array}$$

*More Examples of the same Nature.*

| | | | | |
|---|---|---|---|---|
| From | 743 | 586 | 3785 | *Minorand.* |
| Subtract | 121 | 270 | 205 | *Subtrahend.* |
| Remains | 622 | 316 | 3580 | *Remainder.* |

But if it happen (as many times it will) that any Figure of the Subtrahend, [or lower Number] is bigger than the Figure over him, (so that you cannot take it from him) then always add 10 to the upper Figure, and from their Sum subtract the Figure under it, setting the Remainder under the Line; and when you go to the next Figure below, add 1 thereto, and then subtract it from the Figure over it, if you can, if not, add 10 as before; Do thus as often as you have occasion.

Let

*Example*

Let it be requir'd to ſubtract 4762 from 6681.

The Numbers being plac'd as I before directed, and a Line drawn under them; I begin at the Right-hand, ſaying, 2 from 1 I cannot take, but (adding 10 to 1, it makes 11, therefore I ſay) 2 from 11, and there remains 9, which I ſet under the Line; and proceed to the next place, ſaying, 1 that I borrow'd and 6 is 7, from 8, and there remains 1, which I alſo ſet under the Line; then I go to the next Figure, ſaying, 7 from 6 I cannot, (but adding 10 as before) 7 from 16 and there remains 9, which I ſet down, and proceed, ſaying, 1 that I borrow'd and 4 is 5, from 6, and there remains 1, which I alſo ſet down under the Line, and ſo the Work is finiſhed, and I find the Remainder to be 1919, as you may ſee in the Margin.

| |
|---|
| 6681 |
| 4762 |
| 1919 |

*More Examples of the ſame nature,*

| | | | |
|---|---|---|---|
| From | 3475016 | 3615746 | *Minorand.* |
| Subtract | 738642 | 5864 | *Subtrahend.* |
| Remains | 2736374 | 3609882 | *Remainder.* |

V. But becauſe all Arts are beſt learn'd when the Reaſon of the Rule is given, I ſhall here inform the Reader of the Reaſon why we always add 10 to the upper Figure, when he is leſs than the Figure under him, and why we always add 1 to the next Figure below: Now the reaſon is this, when the upper Figure is leſs than the Figure under him, we borrow 1 from the next upper Figure, and becauſe (as you learnt in Numeration) every 1 in *that* place is 10 in *this*, therefore that 1 which we borrowed is 10, and this 10 we add to the Figure that was too little Then the reaſon why we add 1 to the next Figure below, is this, becauſe

because tho' 1 is ſuppos'd to be borrowed or taken from the next upper Figure, yet the Figure ſtands for his full value, as he did before, and conſequently he now ſtands for 1 more than really he is, (becauſe 1 is ſuppos'd to be taken from him) and therefore we add 1 to the next Figure below, to make him alſo 1 more than he is, that there may be the ſame Difference betwixt them as there was before. So in the Example above, where 4762 is ſubtracted from 6681, becauſe I can't take 2 from 1, I borrow 1 out of 8, ſo there remains but 7; yet the Figure 8 ſtands ſtill, and therefore he now ſtands for 1 more than he is; and becauſe every 1 in the *ſecond* place makes 10 in the *firſt*, therefore that 1 which I borrow'd is 10, which I add to the 1, and it makes 11, out of which I ſubtract 2, and there remains 9. Then I go to the next Figure of the Subtrahend, namely 6, and add 1 to him, that he alſo may be 1 more than he is, as well as the Figure 8 over him. This is the true reaſon of Borrowing and Paying in Subtraction, which Hundreds (who think themſelves good Arithmeticians) are ignorant of.

VI. The Proof of Subtraction is very eaſy; thus —Add the Subtrahend to the Remainder; and if their Sum be equal to the Minorand, then is the Subtraction truly wrought, elſe not. The Reaſon of this Rule is evident; for the Remainder is the Difference of the two Numbers, or how much the greater Number is bigger than the leſſer; and therefore if this Difference be added to the leſſer Number, it muſt make the greater Number again.

*Example.*

| | | |
|---|---|---|
| From —————— | 43758 | *Minorand.* |
| Subtract —————— | 3872 | *Subtrahend.* |
| | 39886 | *Remainder.* |
| | 43758 | *Proof.* |

VII. Com-

VII. Compound or Refpective Subtraction, the Subtraction of Compound or Refpective Numbers; (What they are was fhewn above in Chap. III. of Addition) and is perform'd by this Rule.

Set the leffer Number under the greater, in fuch Order, that every Denomination may ftand under his like, as Pounds under Pounds, Shillings under Shillings, Pence under Pence, *&c.* and fo of any other Denomination, whether they be Weight, Meafure, Time, or the like. Then begin at the leaft Denomination, (namely that the next right hand) and fubtract the undermoft Numbers from thofe over them, and fo procced gradually towards the Left-hand (fetting the Remainder of each Denomination under the Line) till all be finifh'd.

*Example.*

| | l. | s. | d. | q. | |
|---|---|---|---|---|---|
| Borrow'd | 36 | 12 | 10 | 2 | *Minorand.* |
| Paid | 24 | 08 | 06 | 1 | *Subtrahend.* |
| Refts to Pay | 12 | 04 | 04 | 1 | *Remainder.* |
| | 36 | 12 | 10 | 2 | *Proof.* |

The Numbers being plac'd as before, and a Line drawn under them; I begin at the Right-Hand, faying, 1 Farthing from 2 Farthings, and there remains 1 Farthing which I fet under the Line in the place of Farthings, and proceed to the next Denomination; namely, that of Pence, faying, 6 Pence from 10 Pence, and there remains 4 Pence, which I alfo fet under the Line; then I go to the Shillings, faying, 8 Shillings from 12 Shillings, and there remains 4 Shillings, which I fet down under Shillings; and laftly I go to the Pounds, faying, 4 from 6, and there remains 2, which I fet down under the Line; and proceed, faying, 2 from

om 3, and there remains 1. So the Work is fi-
nished; and I find the Remainder to be 12 *l* 4 *s*, *d.* 1 *q*.

But if the lowermost Number in any Denomination change to be greater than the Number over it; then borrow one from the next Denomination, and turn it into the Parts of the lesser Denomination, and add those Parts to the upper Number, and from their Sum subtract the lower Number, setting the Remainder under the Line; and then proceed, and (for the 1 you borrow'd) add 1 to the next lower Number; and proceed in the same Order, till all be finished.

***Example.***

| | *l.* | *s.* | *d.* | *q.* | |
|---|---|---|---|---|---|
| From | 24 | 06 | 10 | 1 | *Minorand.* |
| Subtract | 22 | 18 | 05 | 3 | *Subtrahend.* |
| | 1 | 08 | 04 | 2 | *Remainder.* |
| | 24 | 06 | 10 | 1 | *Proof.* |

Here I say, 3 Farthings from 1 Farthing I cannot, but (borrowing 1 Penny, that is 4 Farthings, I say) 3 from 5, rest 2, which I set under the Line. Then I go to the next Denomination, saying, 1 Penny that I borrow'd and 5 Pence is 6 Pence, then 6 Pence from 10 Pence and there remains 4 Pence, which I set under the Line. Then I go to the Place of Shillings, saying, 18 Shillings from 6 Shillings I cannot, but borrowing 1 Pound, (that is 20 Shillings) I say, 18 from 26, rests 8, which I set under the Line. Then I proceed to the Pounds, saying, 1 that borrow'd and 2 is 3, and 3 from 4, rests 1, which I set down. Lastly, 2 from 2, and there remains 0. So the Work is finished; and the Remainder is 1 *l.* 8 *s.* 4 *d.* 2 *q.*

*Note.*

*Note*, If you have occasion to borrow in the la[st] Denomination, you must always borrow 10, as i[n] Subtraction of Absolute Numbers.

This is all the Difference betwixt Addition and Subtraction,

*Subtraction is the taking* less *from* more,
*Borrowing instead of Carrying as before.*

VIII. It many times happens that many Sums o[f] Numbers are to be subtracted from one Number. As, if there be a Sum lent, and Payment made a[t] several times in part, and you would know how much remains due: In this case you must add th[e] several Payments into one Sum, and subtract th[at] Sum from the Sum lent, and the Remainder wi[ll] shew you how much is due.

*Example.*

| | *l.* | *s.* | *d.* | *q.* | |
|---|---|---|---|---|---|
| Borrowed | 3300 | 00 | 00 | 0 | |
| Paid at seve-ral Paym. | 170 | 10 | 00 | 0 | *To be added together.* |
| | 361 | 13 | 10 | 1 | |
| | 590 | 03 | 04 | 3 | |
| | 73 | 04 | 11 | 3 | |
| Paid in all | 1195 | 12 | 02 | 3 | *Subtrahend.* |
| Remains due | 2104 | 07 | 09 | 1 | *Remainder.* |

*More Questions to exercise the Learner.*

| | *l.* | *s.* | |
|---|---|---|---|
| Borrow'd of my Neighbour, ——— | 150 | 10 | 0 |
| Paid him again, ——————— | 075 | 15 | 1 |
| Remains to pay, ———— | | | |
| The Draper's Bill comes to——— | 48 | 12 | 04 |
| Paid him in part———— | 37 | 15 | 06 |
| Remains due to him———— | | | |

Len

| | l. | s, | d | q. |
|---|---|---|---|---|
| Lent a Friend———————— | 264 | 10 | 09 | $\frac{3}{4}$ |
| Received in part————— | 174 | 15 | 10 | $\frac{1}{2}$ |
| Remains due to me————— | | | | |

From 272 *l.* 17 *s.* 10 *d.* take 174 *l.* 18 *s.* 11 *d.* and tell me what remains?

Borrow'd 742 *l.* 18 *s.* 10 *d.* Paid 140 *l.* 17 *s.* *d.* $\frac{1}{2}$ What remains unpaid?

If you lend a Man four hundred ninety seven Pounds, ten Shillings, and nine Pence; and receive of him one hundred eighty nine Pounds, sixteen Shillings, and six Pence; What is the Man indebted to you?

IX. If the Learner does but throughly understand what has been already taught in this and the foregoing Chapter, he will easily understand the manner of working the following Example of Weights and Measures; there being no more difference between the working of these, and those already laid down, than only observing the Table of each, which are already laid down in Chap. III.

### X. *Subtraction of* Troy-Weight.

| | ℔. | oz. | dw. | gr. | |
|---|---|---|---|---|---|
| Bought —— | 173 | 00 | 13 | 00 | *Minorand.* |
| Sold —— | 78 | 04 | 16 | 15 | *Subtrahend.* |
| Remains—— | 94 | 07 | 16 | 09 | *Remainder.* |
| | 173 | 00 | 13 | 00 | *Proof.* |

### XI. *Subtraction of* Apothecaries Weight.

| | ℔ | ℥ | ʒ | ℈ | gr. | |
|---|---|---|---|---|---|---|
| Bought—— | 12 | 04 | 3 | 0 | 00 | *Minorand.* |
| Sold—— | 08 | 05 | 1 | 1 | 15 | *Subtrahend.* |
| Remains | 3 | 11 | 1 | 1 | 05 | |
| Proof—— | 12 | 04 | 3 | 0 | 00 | |

XII. *Sub-*

## XII. *Subtraction of* Avirdupois Weight.

| | T. | C. | Qu. | lb. |
|---|---|---|---|---|
| Bought | 9 | 18 | 3 | 12 |
| Sold | 7 | 19 | 3 | 24 |
| Remains | 1 | 18 | 3 | 16 |
| Proof | 9 | 18 | 3 | 12 |

| | lb | oz. | dr. |
|---|---|---|---|
| Bought | 12 | 12 | 12 |
| Sold | 8 | 14 | 15 |
| Remains | 3 | 13 | 13 |
| Proof | 12 | 12 | 12 |

## XIII. *Subtraction of* Liquid Measure.

| | Tuns. | Hhds. | Gal. |
|---|---|---|---|
| Bought | 40 | 1 | 30 |
| Sold | 16 | 1 | 40 |
| Remains | 23 | 3 | 30 |
| Proof | 40 | 1 | 30 |

## XIV. *Subtraction of* Dry Measure.

| | qrs. | bush. | pec. |
|---|---|---|---|
| Bought | 10 | 0 | 0 |
| Sold | 5 | 5 | 2 |
| Remains | 4 | 2 | 2 |
| Proof | 10 | 0 | 0 |

XV. Sub

### XV. *Subtraction of* Cloth Measure.

| | *Yrd.* | *qrs.* | *Na.* |
|---|---|---|---|
| ought | 200 | 0 | 0 |
| old | 149 | 3 | 2 |
| emains | 50 | 0 | 2 |
| roof | 200 | 0 | 0 |

### XVI. *Subtraction of* Land Measure.

| | *A.* | *R.* | *P.* |
|---|---|---|---|
| ought | 144 | 3 | 30 |
| old | 86 | 3 | 34 |
| emains | 57 | 3 | 36 |
| roof | 144 | 3 | 30 |

---

## CHAP. V.

## Of *MULTIPLICATION.*

M*Ultiplication* is *that* Rule by which we find the Increase or Amount of any Number, ing so many times taken as there are Units in a-ther Number.

I. This Increase or Amount is called the Fact, ctangle, or Product; and the two Numbers pro-cing it are called the Factors, the *lesser* of which alled the Multiplier, and the *greater* is called Multiplicand. As for Example: If 12 were ven to be multiplied by 2; I say 2 times 12 is 24,

24. Here 2 and 12 (when ſpoken of togethe[r] are called the Factors; but when ſpoken of ſing[ly] 2 is the Multiplier, 12 the Multiplicand, a[nd] the Product,

III. When you are perfect in the Terms (ex-plain'd in the foregoing Section) you may th[en] proceed; but firſt you muſt get by heart, the Pr[o-]duct of any two of the nine Digits, (as times 7 times 8, 8 times 9, &c.) and this you m[ay] learn from the following

*Table of Multiplication.*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 |
| 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 |
| 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 |
| 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 |
| 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 |
| 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 |

This Table is commonly call'd *Pythagoras's* [Ta-]ble, and tho' it be old-faſhion'd, yet (by the [Ex-]perience of my Scholars) I find it to be be[tter] than the new-faſhion'd Tables now commo[nly] made; for many Learners can readily tell you, [that] 6 times 7 (for inſtance) is 24, and yet they c[an]

how many 7 times 6 is, (tho' it be the same) ther will these new Tables tell them; but here y have it both ways.

The Use of this Table is thus: Find the 2 Digits en to be multiply'd together, one in the upper umn of the Table, and the other in the first umn of the Left-hand, and in the Angle of eting you have the Product. Thus the Table dily shews you that 5 times 8 is 40, 6 times 9 54, 7 times 8 is 56, and 8 times 9 is 72, and so the rest.

V. When you have got the foregoing Table fectly by heart, you will soon learn the rest of ltiplication, which is perform'd by this plain general Rule.

Set down the Multiplicand, and under it the ltiplier, in such order as has been taught in dition and Substraction, namely, Units under nits, Tens under Tens, *&c.* and draw a Line der them.

Then, *if the Multiplicand consists of more places n one, and the Multiplier of but one Figure*; begin he place of Units, and multiply the Multiplier o every particular Figure of the Multiplicand, so proceed towards the Left-hand, setting each ticular Product ( *if under* 10) under the Line rder as you proceed: But if any *particular Pro-* amounts to 10, or to just any certain Number Tens, as 20, or 30, or 40, *&c.*) then set down ypher, and carry a Unit for every Ten to the duct of the next Figure; or if it amounts to a- e 10, or any certain number of Tens, set down odd ones that are over and above Ten or Tens, carry one for every Ten, as before. But here , When you come to the last Figure of the tiplicand, set down the whole Product of that re, let it be what it will.

*Example.*

*Example.*

I would multiply 871 by 6; or how many i[s 6]
times 871?

| | |
|---|---|
| Multiplicand | 871 |
| Multiplier | 6 |
| Product | 5226 |

The Numbers being placed according to t[he]
Rule, I begin, saying, 6 times 1 is 6, which (n[ot]
amounting to 10) I set down under the Line, a[nd]
proceed, saying, 6 times 7 is 42, (which being
above 4 Tens, I say) 2 and go 4, that is, I [set]
down 2 and carry 4 in my Mind to the next plac[e;]
then I go on, saying, 6 times 8 is 48, and 4 th[at]
I carry is 52, which being the last place, I [set]
it all down, and so the Work is finished, and I fi[nd]
that 6 times 871 is 5226.

If you have more than one Figure in the Mul[ti-]
plier, the Work is not much different from the fo[r-]
mer; for when you have multiply'd the first F[i-]
gure of the Multiplier into all the Multiplica[nd]
as before directed, proceed to the second and thi[rd]
and all the rest of the Figures of the Multipli[er,]
multiplying each of them into the whole Multip[li-]
cand, and setting down their Products in so ma[ny]
particular Lines as you have Figures in the Mul[ti-]
plier. But here observe, always to set the first F[i-]
gure (of each particular Product) under its pr[o-]
per Multiplier; and when you have done, dr[aw]
a Line under the whole Work, and add their se[ve-]
ral Products together, and their Sum shall be t[he]
total Product requir'd. As in the following E[x-]
ample

Let it be requir'd to multiply 643031 by 6[24,]
or how many is 624 times 643031?

Here in this Case I set down the given Numbers as before, and then I begin and multiply the whole Multiplicand by the first Figure of the Multiplier ) saying, 4 times 1 is 4, which I set down under 4, and go on, saying, 4 times 3 is 12, 2 and go 1, that is, I set down 2 and carry 1, ) then 4 times o is o, and 1 that I carry is 1, which I set down and proceed, saying, 4 times 3 is 12, 2 and go 1; then 4 times 4 is 16, and 1 that I carry is 17, 7 and go 1; then lastly, I say, 4 times 6 is 24, and 1 that I carry is 25, which I set down; and so the Product by the first Figure is 2572124.

```
   643031
      624
---------
  2572124
 1286062
3858186
---------
401251344
```

Then I go to the second Figure of the Multiplier, saying, 2 times 1 is 2, which I set down ( in a line below the former) under 2 the Figure that I multiply by; then I go on, saying, 2 times 3 is 6, which I set down in the same Line, one place more to the Left-hand, and proceed, saying, 2 times o is o, which I set down; then I say, 2 times 3 is 6, which I also set down; then I say, 2 times 4 is 8 which I set down also; and lastly, I say, 2 times 6 is 12, which I set down likewise; so the Product by the second Figure is 1286062. Then I go to the last Figure of the Multiplier, saying, 6 times 1 is 6, which I set down ( in another Line below the other two) one place more towards the Left-Hand than the first Figure of the former Line, namely, under 6, the Figure that I multiply by; then I go on, saying, 6 times 3 is 18, 8 and go 1; then 6 times o is o, and 1 I carry is 1; then 6 times 3 is 18, 8 and go 1; then 6 times 4 is 24, and 1 that I carry is 25, 5 and go 2; and lastly, 6 times 6 is 36, and 2 that I carry is 38; so the Product by the third Figure of the Multiplier

is 38;8186. Then I draw a Line under the particular Products, and add them up into one S which I find to be 401251344, which is the Product of 643031. multiply'd by 624, that 624 times 643031. See the Work in the Ma of the foregoing Page.

*Note*, There is no more difficulty in multi ing by *many* Figures than there is by one, if do but observe to set the first Figure of every ticular product exactly under that Figure of Multiplier that you are multiplying by. Nev theless, I shall lay down some

*More Examples for Practice.*

```
     406345
       4236
    -------
    2438070
   1219035
   812690
  1625380
 ----------
 1721277420
```

```
        6204
          52
        ----
       2481
      62040
     186120
    1240806
   3102015
   --------
   3245576
```

VI. The Proof of Multiplication is commo by casting away the 9's out of the Multipli Multiplicand, and Product; but this Proof be very erroneous, (many times proving the W right when it is wrong,) I shall not here shew Method of it.

The best proof of Multiplication is either Division, (of which Chap. VI.) or else by its o Rule Multiplication, thus: Change Places w the Multiplier and Multiplicand, and multiply over again; and if this last Product be the s with the former, then was the former Work d right, else not.

Exam

| Example. | Proof. |
|---|---|
| 432 | 28 |
| 28 | 432 |
| 3456 | 56 |
| 864 | 84 |
| | 112 |
| 12096 | 12096 |

Here (in this Example) 432 multiply'd by 28, the Product is 12096; so (changing Places with the Multiplicand and Multiplier, as is done in the Proof) the Product of 28 multiply'd by 432, is also 12096. Wherefore I conclude the former Operation was done right.

VII. *Compendiums* in Multiplication.

Altho' the former Rules are sufficient for all Cases in Multiplication, yet because in the Work of Multiplication, many times *great Labour may be sav'd*, I shall acquaint the Learner with some brief Rules to that purpose, and that in the following Cases.

*Case* 1.

When there are Cyphers intermixt with the Signifying Figures of the Multiplier.

In this Case multiply only the signifying Figures, passing by the Cyphers as if there were none, only observing the Rule formerly taught, namely, always to set the first Figure of each particular Product exactly under that Figure of the Multiplier that you Multiply by. As in these Examples.

| | |
|---|---|
| 24393 | 4268312 |
| 402 | 40006 |
| 48786 | 25609872 |
| 97572 | 17073248 |
| 9805986 | 170758089872 |

### *Case* 2.

When the Multiplier ends with a Cypher Cyphers :

In this Case I neglect the Cyphers, (as in first Case) multiplying only the signifying gures ; and when I have done, I annex the pher or Cyphers (in the Multiplier) to the duct ; as in these Examples.

```
   4632            567234
    260               400
  -----         ----------
  27792         226893600
  9264
  -------
  1203320
```

### *Case* 3.

When both the Multiplicand and Multiplier with Cyphers :

In this Case multiply as in the second C (omitting the Cypher in each) and to the Prod annex so many Cyphers as there are at the end both the Multiplicand and Multiplier, as in th Examples.

```
 42600            42300
   220            12000
 -----            -----
  852              846
 852              423
 -------          -------
 9372000          5076000
```

*Note,* In *this* and the foregoing Case I set Signifying Figures of the Multiplier level (on Right Hand) with those of the Multiplicand.

### *Case* 4.

When either the Multiplyer or Multiplica consisteth only of a Unit, and one or more C phers annexed ; as 10, 100, 1000, *&c.*

In this Case, Annex those Cyphers to the other umber, and the Work is done; as in these Examples.

| | | |
|---|---|---|
| ultiplicand | 6402 | 10000 |
| ultiplyer | 10000 | 425 |
| oduct | 640200 | 4250000 |

IX. To multiply by any of the following Numers in one Line, *viz.* 21, 31, 41, 51, 61, 71, , 91.

(Rule) Multiply each Figure in the Multiplind by the Figure in the Tens place of the Mulplyer, and take in all the Multiplicand, excepting that Figure in the Units place, which you must t down (first or last) on the Right-hand of the oduct.

*For Example.*

Multiply 4567 by 71 in one Line.

```
 4567
   71
-----
32425
```

Here I say, 7 times 7 is 49, and 6 (the second Fiire in the Muitiplicand) is 55, 5 and carry 5; 7 nes 6 is 42, and 5 (carry'd) is 47, and 5 (the third gure in the Multiplicand) is 52, 2 and carry 5; imes 5 is 35, and 5 carry'd is 40, and 4 (the last gure in the Multiplicand) is 44, 4 and carry 4; imes 4 is 28, and 4 carry'd is 32, which I set wn as usual; and now the Unit Figure in the ltiplicand, namely 7, I place on the Right Hand the Product, or you may put it down at the t beginning of the Work, as by the whole Oation following.

```
  4567
    71
------
324257
```

 X. To

X To multiply by any of the Numbers in the last Section with a Cypher or Cyphers annext, as 210, 410, 7100, 810000. &c.

Set the o's down first (or last) and work as before.

*Example.*

$$\begin{array}{r} 4567 \\ 7100 \\ \hline 32425700 \end{array}$$

XI. How to multiply by these Numbers following in one Line, *viz.* 112, 113, 114, 115, 116, 117, 118, 119.

(Rule) Multiply each Figure of the Multiplicand by the Unit Figure of the Multiplyer, and to the Product of the Second Place (or Tens) add its single back Figure; and to the Product of the rest, add the Sum of its 2 back Figures: An Example will make it plain.

*Example*, Multiply 2345 by 115 in one Line.

$$\begin{array}{r} 2345 \\ 115 \\ \hline 269675 \end{array}$$

I say 5 times 5 is 25, 5 and carry 2; 5 times 4 is 20, and 2 carry'd is 22, and 5 (which is the single back Figure to 4) is 27, 7 and carry 2; 5 times 3 is 15, and 2 carry'd is 17, and 9 (the Sum of the two back Figures 4 and 5) makes 26, 6 and carry 2; 5 times 2 is 10, and 2 carry'd is 12, and 7 (the two back Figures 3 and 4 added) is 19, 9 and carry 1; then 1 carry'd and 5 (the two last Figures 2 and 3 added) is 6, which I set down, and 2 (the last Figure) is 2, to be placed last. See the whole Work repeated again.

$$\begin{array}{r} 2345 \\ 115 \\ \hline 269676 \end{array}$$

f Cyphers are annext, set them down first, (or
) and work as before, as thus.

| |
|---:|
| 2345 |
| 115000 |
| 269675000 |

XII. To multiply by 211, 311, 411, 511, 611,
, 811, 911, in one Line.

(Rule) Set down the Unit Figure of the Multi-
and, and also the Sum of the first and second
ures added (and carry the Tens to the next place
they should make any,) then multiply all the
ltiplicand by the Figure in the Hundreds place
the Multiplyer, and to each Product add the
of the two Figures standing next before the
ure multiplyed.

*Example.*

| |
|---:|
| 4562 |
| 411 |
| 1873982 |

First I set down 2 (the Unit Figure,) and next
I set down the Sum of the first and second Fi-
es (6 and 2 added) which is 8, then I proceed
multiply all the Multiplicand by 4 (the Figure
he Hundreds place of the Multiplyer) saying,
mes 2 is 8, and 11 (which is the Sum of 6 and
e two Figures standing next before 2, the Fi-
multiplyed) makes 19, 9 and carry 1; 4 times
24, and 1 carried is 25, and 9 (the Sum of
next two Figures before 6) is 34, 4 and carry
4 times 5 is 20, and 3 is 23, and 4 (the only
re before 5) is 27, 7 and carry 2; then 4
s 4 is 16, and 2 carry'd is 18, which I set
n as usual. See the Work above.

*estions to exercise the Learner in* Multiplication.

. Multiply Seventy Four Thousand Three
dred Forty Nine, by Four Hundred Ninety

*Answer.*

2. What is the Product of Three Millions F Hundred Ninety Six Thousand, multiply'd by veenteen Thousand Eight Hundred Seventy Ni

*Answer.*

# CHAP. VI.

## Of *DIVISION.*

I. Division is *that* Rule which teaches how divide [or part] any given Number in what Number of equal Parts we please.

Or, It is that Rule by which we discover ho often [or how many times] one Number is co tain'd in another.

II In Division there are these 4 Terms to learn'd; namely, the *Dividend*, the *Divisor*, t *Quotient*, and the *Remainder*. The *Dividend* is t Number given to be divided [or parted] into qual Parts. The *Divisor* is the Number given which the Dividend is to be divided, and whi shews into how many equal Parts the Dividend to be divided. The *Quotient* is the Number foun out by the Operation, and is so call'd, because shews *how often* the Divisor is contain'd in the D vidend. The *Remainder* is the Number which mains after the Operation is ended.

Thus suppose 15 were given to be divided by (or into 3 equal Parts) here 15 is the Dividend, is the Divisor, and 5 the Quotient, or one of tho 3 equal Parts that the Dividend is divided into. this Example there was no Remainder, because is found in 15 just 5 times, without any thing maining; but if you were to divide 20 by 3, t

Quot

uotient would be 6, and the Remainder 2; for s contain'd in 20, 6 times, and 2 remains over.

III. Having thus got a perfect Knowledge of e *Nature* of Division, and of the *Terms* belonging it; you may then proceed to the Operation [or ork] of Division, which is perform'd by this ule.

First, Set down the Dividend, and draw a crook- Line at the Left Side thereof, behind which set e Divisor. Draw also another crooked Line at e Right-Side of the Dividend, for a Place for the uotient to stand in.

For Example, Divide 636 by 3: The Numbers ust be placed thus.

Dividend
Divisor 3) 636 ( Quotient.

If the Divisor consist but of one *Figure* (as in is Example) see whether the first Figure (name- that next the Left-Hand) of the Dividend be as g as your Divisor; if it be, make a Point under , which call the Dividual; but if it be *not*, then ake your Point under the second Figure of the ividend; so the Dividual will (in this case) con- st of two Figures.

In the Example above I find the first Figure of e Dividend, namely 6, to e as big as the Divisor (3) herefore I make a Point un- er it as in the Margin.

Dividend.
Divis. 3) 636 ( Quo.

Having thus found my Dividual, I seek how ften I can find the Divisor in the Dividual, and et that Figure in the Quotient; and by it multi- ly the Divisor, and set the Product under the Divi- ual, and (drawing a Line under it) subtract it herefrom, setting the Remainder under the Line.

Dividend.
Divis. 3) 636 (2 Quo.
·
6
—
0

For Instance in this Ex-ample, say 3 (the Divisor) I can find in 6 (the Dividual) twice or 2 times, therefore I set 2 in the Quotient, and by it multiply the Divisor 3, and the Product is 6, which I set under 6, in the Dividend, and subtract it therefrom, and there remains 0.

Then make a Point under the next Figure of the Dividend, and draw him down (that is, set that Figure down) to the Remainder; so the Remainder, together with the Figure thus drawn down shall make a new Dividual.

Dividend.
Divis. 3) 636 (2 Quot.
· ·
6
—
03 new Divid.

As thus, I make a Point under the next Figure of the Dividend (namely 3,) and I draw him down below the Line for a new Dividual. Then I proceed with the new Dividual, as I did with the former, finding another Figure to put in the Quotient.

Dividend.
Divis. 3) 636 (21 Quo.
· · ·
6
—
03
3
—
06

That is, I say 3 (the Divisor) I can find in 3 (the new Dividual) once, therefore I set 1 in the Quotient, and by it multiply the Divisor, and the Product is 3, which I set under 3, and subtract it from it, and there remains 0, which I set under the Line, and to it bring down the next Figure, namely 6, for a new Dividual, as in the Margin.

The

Then laſtly, 3 in 6 I [c]an find twice, therefore [I] put 2 in the Quotient, [a]nd by it I multiply the [D]iviſor 3; ſo the Pro-[d]uct is 6, which being [ſe]t under 6, and ſubtract-[e]d from it, there remains [0]; ſo the Work is end-[e]d, and I find the Quoti-[ent t]o be 212; and ſo many [ti]mes is 3 contain'd in [6]36, or 636, divided in-[t]o 3 equal Parts, 212 is one of them.

| | |
|---|---|
| | Dividend. |
| Diviſ. 3) | 636 (212 Quo. |
| | 6 |
| | 03 |
| | 3 |
| | 06 |
| | 6 |
| | 0 Rem. |

If at any time the Diviſor be greater than the [D]ividual, then you muſt put a Cypher in the [Q]uotient, and draw down another Figure to the [D]ividual.

*Note* this, as a Brief and General Rule in all [k]inds of Diviſion, whether the Diviſor conſiſt but [o]f *one* or more Figures: namely, Firſt, to ſeek how [o]ften the Diviſor is contain'd in the Dividual; and [ſe]condly, (having put the Anſwer in the Quoti-[e]nt) multiply the Diviſor thereby; and thirdly, [ſ]ubtract the Product from the Dividual; and [f]ourthly, draw down the next Figure of the Di-[v]idend to the Remainder for a new Dividual. All [w]hich Operations, for Memory's ſake, may be [c]omprized in this Diſtich.

*Seek, ſet in Quote; multiply and ſubtract;*
*Draw down, and thus proceed, you'll be exact.*

A few Examples will make this Rule plain to [t]he meaneſt Capacities.

*Example* 1.

Let is be requir'd to divide 848 by 4, or into 4 [e]qual Parts. Or how often is 4 contain'd in 848?

The

```
        Dividend.
Divis. 4) 848 (212 Qu.
          ...
          8
         ---
          04
           4
         ---
           08
            8
         ---
            0 Remaind.
```

The given Numb being set down as befo directed, and as is he done in the Margin; begin, saying, 4 I c find in 8 twice, or times; therefore I set in the Quotient, and b it I multiply the Divis 4, and the Product is which I set under 8 i the Dividend, and sub tract it therefrom, an there remains 0. Then I make a Point under th next Figure of the Dividend, (namely 4) and dra him down below the Line for a new Dividua Then I work with this Dividual as with the fo mer, saying, 4 I can find in 4 once; therefore set 1 in the Quotient, and by it I multiply th Divisor; and the Product is 4. which I set unde 4, and subtract it from it, and there remains o which I set under the Line, and to it I bring dow the next Figure (namely 8) for a new Dividua Then lastly, I say, 4 in 8 I can find twice; there fore I put 2 in the Quotient, and by it I multiply the Divisor, so the Product is 8, which being se under 8, and subtracted from it, there remains 0 So the Work is ended, and I find the Quotient t be 212; and so many times is 4 contain'd in 848 or 848 divided into 4 equal Parts, 212 is one o them.

*Example 2.*

Again, If it were required to divide 946 by 8 the Quotient would be 118. See the following Work,

*Ex.* 2.

```
8) 946 (118
   ...
   8..
   ----
   14:
    8:
   ----
    66
    64
   ----
     2 Remainder:
```

*More Examples for Practice.*

*Example* 3.

```
8) 84617 (10577
    ....
   8....
   -----
   046..
    40..
   -----
     61.
     56.
   -----
     57
     56
   -----
      1
```

*Examp.* 4.

```
9) 13908 (1545
     ...
   9...
   -----
   49..
   45..
   -----
    40.
    36.
   -----
    48
    45
   -----
     3
```

Here in this third Example, I cannot find 8 the visor in (4) the second Dividend, and therefore ut a Cypher in the Quotient (according to the le laid down before) and bring down the next gure (6) for a new Dividual, and then I prod as before: Therefore here note once for all, hat I have already told you) That whenever u bring down a Figure, and cannot then find Divisor in the Dividual, you must put a Cyer in the Quotient, and bring down another Fire for a new Dividual.

There

There is another way of dividing by one Fi-
gure, which is more short, and is this.

*Example*

Divide 4857 by 3.

The given Numbers being placed as befo[re]
draw a Line under them thus.

3) 4857
__________

__________

Then say how often, or how many times 3 whi[ch]
is the Divisor, can you have in 4 (the first Figu[re]
towards the Left Hand of the Dividend) the An-
swer is once, which I place in the Quotient exa[ct-]
ly under the 4, as you see in the Margi[n,]
saying, take once 3 out of 4 and there r[e-]
mains 1, which 1 is 1 Ten to be add[ed]
to the next Figure 8, which makes 1[8;]
then seek again, or ask how often 3 (t[he]
Divisor) can you have in 18? the An-
swer is 6 times, which 6 place in t[he]
Quotient under 8, the second Figure [of]
the Dividend, and say, 6 times 3 is [18]
out of 18, and there remains 0, (a[nd]
here because 0 remains, I have 0 to ca[r-]
ry or add to the next Figure;) then [say]
again how many times 3 can I have in [5]
the third Figure of the Dividend? *An[swer]*
Once, which I place under 5, sayin[g]
once 3 is 3, out of 5, and there remai[ns]
2, which is 2 Tens (or Twenty) to [be]
added to 7, the fourth and last Figure [of]
the Dividend, and it will make 27. Th[en]
lastly, seek how often the Divisor 3 y[ou]
can have in 27, the Answer is 9 tim[es,]
which I place under 7, the last Figure [of]
the Dividend, and the Work is done, [as]
you may see in the Margin.

| | |
|---|---|
| 3) 4857 | 1 |
| 3) 4857 | 16 |
| 3) 4857 | 161 |
| 3) 4857 | 1619 |

*More Examples done after the ſame manner.*

| | | |
|---|---|---|
| 6725 (1 | 5) 7425 | 8) 8976 |
| 1681 | 1485 | 1122 |
| 8274 | 7) 8974 | 9) 9987 (5 |
| 1379 | 1282 | 1108 |

*Note*, If the firſt Figure of the Dividend be leſs n the Diviſor, then take the 2 firſt Figures of Dividend, and proceed as before.

*Example.*

6) 4272 (

712

*Note* alſo, If any thing remain after the Divi- is ended, place it a little diſtance from the laſt gure in the Quotient, with a crooked Line round as it the firſt and laſt Examples above.

IV. When you are perfect in dividing by one gure, you may then proceed to divide by 2, 3, more Figures; which Work is but little diffe- nt from the other, and is thus perform'd.

Firſt, ſet down the Dividend and Diviſor, as as directed in the forgoing 3d Section of this hapter.

Then ſee how many Places of Figures you have the Diviſor, and take juſt ſo many of the firſt igures of the Dividend, and make a Point under e laſt of them to note your Dividual. Then con- der whether the Dividual be *bigger* or *leſs* than e Diviſor; for if it be *leſs*, then muſt you take e Figure more to your Dividual.

Having thus found your firſt Dividual, ſeek how

how often you can find the *first Figure* (next Left-Hand) of the Divisor, in the *first Figure* of the Dividual, if they consist of an equal Number of Figures, but if the Dividual have one Figure more than the Divisor, then see how often you can have the *first Figure* of the Divisor in the two *first Figures* of the Dividual, and set the Answer in the Quotient; and by this Figure put in the Quotient, multiply the whole Divisor, setting the Product under the Dividual, and subtracting it therefrom; and to the Remainder bring down the next Figure for a new Dividual. Proceed in the same manner till the Work be ended, for this is all the difference betwixt the dividing by one Figure and by many: I say, all the difference consists in these 3 Particulars, namely (1.) In finding the first Dividual. (2.) In seeking how often the first Figure of the Divisor is contain'd in the first, or two first Figures of the Dividual. And (3.) In multiplying the whole Divisor by the Figure put in the Quotient. A few Examples will make it plain.

*Example* 1.

Let it be requir'd to divide 9464 by 24.

First, I put down the given Numbers as before directed: Then, because the Divisor consists of 2 Figures, I put a Point under the second Figure of the Dividend, namely under 4; then I seek how often I can find 2, (the first Figure of the Divisor) in 9, (the first Figure of the Dividual,) the Answer is 4 times, therefore I put 4 in the Quotient, and thereby multiply the whole Divisor, and find the Product to be 96, which being greater than the Dividual, (94) I cancel the 4 put in the Quotient, and instead thereof I put 3, (a Unit less) and by it I multiply the Divisor 24, and the Product is 72, which I set under, and subtract from (94) the Dividual, and there remains 22. Then I ma

ke a Point under the next Figure (namely 6) he Dividend, and bring him down to the Re- nder; ſo I have 226 for a new Dividual, and Work will ſtand thus.

| Diviſor. | Dividend. | Quotient. |
|---|---|---|
| 24) | 9464 | (3 |
| | 72 | |
| | 226 | |

Then I go to the new Dividual, and becauſe he one Figure more than the Diviſor, therefore I how often 2 (the firſt Figure of the Diviſor) ontain'd in 22 (the 2 firſt Figures of the Divi- l) I ſay 9 times, (for I muſt never take it a- e 9 times, tho' I can) therefore I put 9 in the otient, and thereby multiply the Diviſor, and Product is 216, which I ſet under the Dividu, and ſubtract it from it, and there remains 10; which Remainder I bring down the next Fi- e of the Dividend, ſo my new Dividual is 104, the Work will ſtand thus.

```
24) 9464 (39
    72
    226.
    216.
    104
```

Then this new Dividual being alſo one Figure re than the Diviſor, I ſeek how often I can find n 10, which I can do 5 times; but multiplying Diviſor by 5, the Product is 120, which is ater than the Dividual, and therefore I take it e leſs, and ſo put 4 in the Quotient, by which ultiply the Diviſor, and the Product is 96, which

which I set under, and subtract from the Dividual, and there remains 8; so the whole Work is ended, and will stand thus.

| Divisor, | Dividend. | Quotient. |
|---|---|---|
| 24) | 9464 | 394 |
| | 72 | |
| | 226 | |
| | 216 | |
| | 104 | |
| | 96 | |
| | 8 Remainder. | |

V. Before I lay down any more Examples, I shall lay down the following Notes.

*Note* 1. When at any time you have multiply'd the Divisor by the Figure last put in the Quotient, if then the Product be greater then the Dividual, then is that Figure put in the Quotient too big, and must be made less by a Unit; therefore cancel [or cross out] that Figure, and put another in his Room, one less than the former; and by this last Figure multiply the Divisor again, and if the Product be still greater than the Dividual, make the Figure in the Quotient yet less by a Unit. Thus do till your Product be less than the Dividual, or at least equal thereto, and then make Subtraction, and proceed as before.

2. Likewise, when you have multiply'd the Divisor by the Figure last put in the Quotient, and subtracted the Product from the Dividual; if then the Remainder be greater than the Divisor, then the Figure last put in the Quotient is too little, and must be made bigger, in the same manner as in

the former Case it was made less; for the Remainder must never be greater than the Divisor.

3. That you must never put more than 9 in the Quotient at one time, tho' you can find the first Figure of the Divisor oftener in the first, or two first Figures of the Dividual.

4. That the *Remainder* after Division is ended, is always of the same Denomination with the Dividend. As suppose in the foregoing Example, the Dividend 9464 were so many Shillings, to be equally divided betwixt 24 Men; then the Quotient shews that each Man must have 394 Shillings, and there is 8 Shillings over. Now, I say, the 8 that remains is of the same Denomination with the Dividend, namely Shillings. If therefore these 8 Shillings were turn'd into Pence, (which is done by multiplying them by 12) they would be found equal to 96 Pence; which if you divide by 24, the Quotient is 4; so the exact Share of each Man would be 394 *s.* 4 *d.*

5. What is to be done with the Remainder after Division is ended, shall be shew'd in its due Place; but in the mean time the Learner ought to know, that it is the Numerator of a Fraction, and the Divisor is the Denominator of it, which Fraction is part of the Qnotient; so the true Quotient of the first Example is $394\frac{8}{24}$, that is, (supposing it Shillings as in the 4th Note) 394 *s.* and 8 Parts of 24 (or one third Part) of a Shilling, equal to 4 *d.* as before.

VI. The Proof of Division is by Multiplication thus; Multiply the Quotient by the Divisor, and to the Product add the Remainder (if any be) and if the Sum be the same with the Dividend, the Work is done right, or else not.

Division may also be prov'd by Division, thus; Subtract the Remainder (if any be) from the Dividenid

vidend, and divide the Remainder by the Quoti-ent, and (if the Work be done right) this Quoti-ent shall be equal to the Divisor.

*The Ancient Proof by 9's I shall omit,*
*Because I know there is no Truth in it.*

The following Examples I shall prove by Mul-tiplication.

*Example* 2.

```
385) 1183653 (3074            3074
       ....                    385
     1155...                 -------
     -------                  15370
      2865.                  24592
      2695.                   9222
     -------                 -------
       1703                  1183490
       1540                      163
     -------                 -------
Remaind. (163)               1183653   Proof.
```

*Example* 3.

```
Divis. Dividend. Quot.
 587)  4763585  (8115
          ...                  8115
                                587
       4696...               -------
       -------                56805
         675..               64920
         587..              40575
       -------              -------
         888.               4763505
         587.                    80
       -------              -------
         3015               4763585   Proof.
         2935
       -------
Remaind. (80)
```

These Examples are sufficient to explain Divisi-on to the meanest Capacity.

VII. Com-

VII. Compendiums in *Division*.

Many times the Work of Division may be very uch shortned. For,

1. *If the Divisor has one or more Cyphers on the ght-hand*, cut off so many Figures on the Right-nd of the Dividend, as there are Cyphers on the ght-hand of the Divisor; and divide the remain-g Figures of the Dividend, by the remaining gure or Figures of the Divisor; and to the Re-inder annex those Figures cut off from the Di-dend. But if there be no Remainder, then those gures (alone) cut off from the Dividend shall be Remainder.

*Example.*

Let it be requir'd to divide 46658 by 400. See e the Work.

```
4|00) 466|58 (116
      .....
      4....
     ------
       6...
       4...
     ------
       26..
       24..
     ------
Remainder (258)
```

2. *If the Divisor consist only of a Unit with Cyphers,* 10, 100, 1000, *&c.*) cut off so many Figures the Right-hand of the Dividend as there are phers in the Divisor, and the Work is done. those Figures thus cut off are the Remainder: the Figures remaining on the Left-hand are Quotient.

*Example.*

Let it be requir'd to divide 4567891 by 1000. the Work.

Quotient Remainder
4567|891

Here

Here are 3 Figures cut off from the Dividend because there are so many Cyphers in the Divisor.

There is another way of Division (commonly call'd the short *Italian* way) wherein you multiply and subtract in your Mind, and set down only the Remainder. This Way is done by the following

*Rule.*

First being to ask the Question (as before) how often the first Figure on the Right hand of the Divisor is contain'd in the first Figure, (if it may be had) or else in the two first Figures of the Dividend; and set the Answer in the Quotient, with which Answer proceed to multiply the Unit Figure of the Divisor, and instead of setting down the Product (as in the other way) you bear it in mind, marking what Tens and Units are in the Product; and subtract it from the same Number of Tens as this Product makes, added to the Figure from whence you are to make your Subtraction in the Dividend (if it can be taken, but if not, add Ten more to it, and then take the said Product from it) and set down what remains, carrying the Tens to the Product of the next Figure in the Divisor, and proceed as before. An Example or two will make it plain.

*Example.*

465) 19546 (

Here I should begin and say, how often 4 (the first Figure on the Right-hand of the Divisor) is contain'd in 1 (the first Figure in the Dividend) but because the Answer is 0, I say how often 4 is contain'd in 19 (the two first Figures of the Dividend) the Answer is 4 which

465) 19546 (4 put in the Quotient (as in the Margin.) Then by this 4 in the Quoti-

Quotient I proceed to multiply 5 (the Unit Fi-
ure of the Diviſor) ſaving, 4 times 5 is 20,
hich Product, (inſtead of ſetting down as in the
ther way, I bear in mind, and ſubtract it from
e ſame Number of Tens) as this Product makes,
amely 20) added to the Figure from whence I
n to make the Subtraction, namely 4, (the fourth
igure in the Dividend) that is
om 24, and there remains 4
s in the Margin) and carry 2
he Tens) to the Product of the
xt Figure of the Diviſor, ſay-

465) 19546 (4
4

g, 4 times 6 (the ſecond Figure in the Diviſor)
24, and 2 (that I carry) is 26; which Product
hould proceed to take from 25, (that is, the ſame
umber of Tens as in the laſt Product added to 5,
e third Figure in the Dividend) but I cannot,
erefore I borrow Ten (as in the common Way of
btraction) and add to 25 and
makes 35: Then I ſay 26 from
, reſts 9, (as *per* Margin) and
ry 3 (the Tens) to the next
gure of the Diviſor, ſaying, 4

465) 19546 (4
94

nes 4 (the firſt Figure of the Diviſor) is 16, and
that I carry) is 19 from 19, reſts 0, ſo the whole
mainder is 94 (ſee the Mar-
) to which I bring down 6,
next Figure of the Dividend,
it makes 946 for a New Di-
ual (or Dividend) thus.

465) 19546 (4
94

465) 19546 (4
946 New Divid.

Then I go on to repeat the ſame Work again,
efore, and ask how often 4 (the firſt Figure of
Diviſor) can I have in 9, (the firſt Figure of
New Dividend) or (which is the ſame thing)
how

how often 465 (the Divisor) can I have in 9 (the Dividend) and the Answer is twice, (or times) which 2 I put in the Quotient (as you see in the Margin) and by it proceed to multi the Unit Figure of the Divis and subtract as before, saying times 5 is 10, from 16 (that is one Ten, as the last Product added to the Unit Figure of New Dividend rests 6 and carry (the Ten) to next Figure of Divisor, saying times 6 is 12, 1 (I carry) is from 14 (that is one Ten, as in the last Prod added to 4, the second Figure of the new Di dend) rests 1 carry 1 (the T to the next Fig of the Divisor, ing, 2 times 4 first Figure of Divisor) is 8, 1 (I carry is) 9, from 9 (the first Figure in New Dividend) rests 0; so the last Remainde the Division is 16, as appears by the whole O ration in the Margin.

465) 19546 (42

946

465) 19546 (42

946 New Dividend.

6

465) 19546 (42

946 New Dividend.

16

Dividend.

Divisor 465) 19546 (42 Quotient.

946

16 Remainder.

*More Examples of the short* Italian *Way follow.*

Dividend.
Divisor 678) 14978 (22 Quotient.

1418

62 Remainder.

Dividend.
Divisor 8542) 9157897 (1072 Quotient.

61589

17957

873 Remainder.

Having now gone through both Ways of *Itali-* Division, I leave the Learner to use that which meth best to him: But since the Design of this eatise is chiefly intended for the meanest Capa-y, I shall keep to the former Way, because I nk it is less burthensome to an Ordinary Me-ory.

I could here proceed to shew the Reader 9 or 10 her different Ways of Division, but one or two od Ways is enough; and I love not to fill a arner's Head with too many Things at once, or puzzle him with more than is needful.

*Question in* Division.

Q. 1. Divide Three Hundred Forty Five Thou-d, Nine Hundred Seventy Two, into Four ndred Seventy Four equal Parts.

*Answer.*

Q. 2. If Eight Thousand Seven Hundred Thirty ght pounds be divided among Seven Hundred nety Four Men, what is each Man's Share?

*Answer,*

D Thus

Thus have I done with the Five Principal P[arts] of Arithmetick, namely, *Numeration*, *Addition*, [Sub]*traction*, *Multiplication*, and *Division*: And u[pon] *these* all the following Rules (and all other Op[era]tions whatsover, that are possible to be wrought [by] Numbers) do immediately depend. Therefo[re I] advise the Learner to practise, and be very per[fect] in those Rules, before he proceed any further.

## CHAP. VII.

### Of REDUCTION.

I. REduction is *that* Rule which teacheth h[ow] to bring a Number from one Denominat[ion] to another; as Pounds into Shillings, Shilli[ngs] into Pence, &c.

It also teaches how to bring Numbers consi[sting] each of two or more Denominations into one [De]nomination.

II. Reduction is of two Kinds, *Descending* [and] *Ascending*.

III. Reduction *descending*, is the bringing [of] Greater Denominations into Lesser; as Pounds [in]to Shillings, Shillings into Pence, &c. And [this] is done by Multiplication, by this

*General Rule.*

Consider how many of the Lesser Denominat[ions] are equal to one of the Greater, and multiply [the] given Number thereby; so the Product shall [be] the Answer to the Question.

*Example.*

Reduces 8643 Shillings into Pence, or how [ma]ny Pence are there in 8643 Shillings.

In 8643 Shillings, how many Pence.

```
 8643
   12
 -----
17286
 8643   Answer, 103716 Pence.
 -----
103716
```

ere I consider that 12 Pence is a Shilling, and the Pence ought to be 12 times the Number Shillings; wherefore I mulitiply the given nber of Shillings by 12, and the Product is 716 Pence, which is the Answer to the Que- n.

eduction *ascending* is the bringing of Lesser ominations into Greater; as Pence into Shil- s, Shillings into Pounds, *&c.* and this is done Division by this.

*General Rule.*

onsider how many of the given Numbers are l to one in *that* Denomination to which you ld reduce your given Number, and divide your n Number thereby; so the Quotient shall be Answer requir'd.

*Example.*

 103716 Pence how many Shillings?
ere I consider that 12 Pence is a Shilling, and the Shillings ought to be but a Twelfth Part e Pence; wherefore I divide the given Num- of Pence by 12, and the Quotient is 8643 lings, which is the Answer to the Question. e the Work.

```
   Pence.   Shillings.
12) 103716 (8643
    96...
    -----
     77..
     72..
     -----      Answ. 8643 Shillin
      51.
      48.
      -----
       36
       36
       -----
        0
```

I shall Illustrate these General Rules more p ticularly, by Examples of all the several Redu ons of Money, Weights, and Measure commo used amongst us. In the doing of which you m always recal to your Mind the Note or Tabl that Head we are treating of: My Meaning when we are doing of Reduction of Money, must remember the Note of the several Deno nations of Money, namely, that 4 Farthings m a Penny, 12 Pence a Shillings, and 20 Shilling Pound; So likewise in Reduction of Avoirdup Weight, you must recollect the Note of Weight, namely, that 16 Drams make an Ou 16 Ounces a Pound, 28 Pound a quarter of a H dred, 4 quarters a Hundred, 20 Hundred a T And so of the rest of the Weights and Measur all which are laid down in Addition, and the fore need not to be repeated again.

Having noticed this, I begin with Reduction Money (or Coin) descending; to do which best way is to reduce the given Number into next lesser Denomination, and from thence to next lesser Denomination, and from thence to next lesser, and so till you come to the Denomin on requir'd.

Exam

*Example.*

586 Pounds, how many Shillings, Pence and hings.

| | | |
|---|---|---|
| | *lib.* | |
| | 586 | |
| tiply by | 20 | the Shillings in a Pound. |
| Makes | 11720 | Shillings. |
| tiply by | 12 | the Pence in a Shilling. |
| | 23440 | |
| | 11720 | |
| Makes | 140640 | Pence. |
| tiply by | 4 | the Farthings in a Penny. |
| Makes | 562560 | Farthings, for Answer. |

lere I multiply the given Number 586 *l.* by 20 cause 20 Shillings make a Pound) to reduce n into the next lesser Denomination, namely, llings, and the Product is 11720 Shillings; n I multiply the Shillings by 12 (because 12 ce is a Shilling) to reduce them into the next r Denomination to Shillings, namely, Pence, the Product is 140640 Pence. Lastly, I muly the Pence by 4 (because 4 Farthings is a ny) to reduce them into the next lesser Denoation, namely, Farthings, and the Product is 560 Farthings, as above.

When the given Number does not consist of ers Denominations, as Pounds, Shillings, and ce, or Hundreds, Quarters, and Pounds, &c nay be reduc'd into the Denomination requir'd ne Operation; so the given Number above, nely, 586 *l.* may be reduc'd into Pence or Farigs at one Work thus.

Multiply the given Number 586 *l.* by 240 (bese 240 Pence make a Pound) and the Product ence: See the Work following.

| | | |
|---|---|---|
| | *lb.* | |
| | 586 | |
| Multiply by | 240 | the Pence in a Pound. |
| | 23440 | |
| | 1172 | |
| Makes | 140640 | Pence. |

Alſo Multiply 586 *l.* by 960 (becauſe 960 F[arth]things make a Pound) and the Product will [be] Farthings, as followeth.

| | | |
|---|---|---|
| | *lb.* | |
| | 586 | |
| Multiply by | 960 | the Farthings in a Pound. |
| | 35160 | |
| | 5274 | |
| Makes | 562560 | Farthings. |

*Reduction of* Money (*or* Coin *Aſcending.*

All Queſtions aſcending (as tolk before) [are] wrought by Diviſion.

*Example.*

In 562560 Farthings how many Pounds.

To do this Queſtion, or any of this kind, I f[irſt] divide the given Number, namely, 562560 F[ar]things by 4, and the Quotient is 140640 Pen[ce]. Then I divide the Pence by 12, and the Quoti[ent] is 11720 Shillings. Laſtly, I divide the Shilli[ngs] by 20, and the Quotient is 586 Pounds. See [the] Work.

```
  q.      12) d.      2|0   s.
) 562560 (140640 (1172|0 (586 Pounds.
   ......  .....      ..
  4 ....  12 ....    10 ..
  ——  ...  —— ...    —— ..
  16 ..    20 ...    17 .
  16 ..    12 ..     16 .
  ——— ..   —— ..     ——
   025 .   86 ..     12
     24 .  84 ..     12
     16      24
     16      24
    ————   ————     ——
     00      00
```

*Or thus.*

Farthings.

```
96|0) 56256|0 (586 Pounds.
      480 ..
      ——————
      825 .
      768 .
      ——————
        576
        576
      ——————
          0
```

I have wrought this Example two ways; in the ſt I have brought the given Farthings through l the intermediate Denominations, reducing them ſt to the next Greater, and from thence to the ext, and ſo on till I come to the Denomination quir'd, namely, Pounds. In the other way, I ought the Farthings into Pounds at one Operaon, by dividing them by as many Farthings as ake a Pound, namely, 960.

*Note*, That to ſave removing my Dividends, I ave ſet the Diviſor at the top, where I have alſo

 ſet

set a Letter to note what Denomination each Number is; so I have written *q.* over the Farthings, *d.* over the Pence, and *s.* over the Shillings.

When in Reduction descending the *Numbers given to be reduced consist of divers Denominations*, as Pounds, Shillings, and Pence; or Hundreds, Quarters and Pounds, *&c.* Then in this case, reduce the greatest Denomination into the next lesser (by the Rules already laid down) and add thereto the Number standing in that Denomination which your greatest Numbers is reduc'd to: Then reduce that Sum into the next lesser Denomination, adding thereto the Number standing in that Denomination: Do this till you have brought the given Number into the Denomination requir'd.

*Example.*

In 4327 *l.* 15 *s.* 11 *d.* 2 *q.* how many Shillings, Pence and Farthings?

| | *l* | *s.* | *d.* | *q.* |
|---|---|---|---|---|
| | 4327 | 15 | 11 | 2 |

Multiply by 20 the Shillings in a Pound, and (add 15 s.

Makes 86555 Shillings.

Multiply by 12 the Pence in a Shilling, and (add 11 d.

173111
86556

Makes 1038671 Pence.

Multiply by 4 the Farthings in a Penny, and (add 2 q.

Makes 4154686 Farthings, for Answer.

Here I say, 0 times 7 is 0, but 5 (in the place of Units of Shillings) is 5, which I put down for the first Figure of the Product: Then, because this

Multi-

ltiplier is o, I go no further with it, (for if I uld it would be all o's) but proceed to the se- d Figure of the Multiplier, saying, 2 times 7 4, and 1 in the place of Tens of Shilling is I set down 5, and carry 1 to the next place ; so I finish the Multiplication by the common thod, and find the Shillings in 4327 *l.* 15 *s*, to 86555.

Then I proceed to bring the Shillings into Pence, multiplying them by 12 ; and here I say, 2 es 5 is 10, and 1 (in the place of Units of nce) is 11 ; I set down 1, and carry 1 ; and so till I finish multiplying by 2. Then I go to the ond Figure of the Multiplier, namely, 1, say- once 5 is 5, and 1 (in the place of Tens of nce) is 6, which I set down, and then go on till finish the Multiplication by the common Me- d, and the Product is 1038671 Pence.

Lastly, I proceed to bring the Pence into Far- ngs, by multiplying them by 4 ; and here I say, imes 1 is 4, and 2 (in the place of Farthings) 6, which I set down, and go on till I finish the ltiplication by the common Method, and the duct is 4154686 Farthings in 4327 *l.* 15 *s.* *d.* 2 *q.*

After this Method are all other Examples of the Nature wrought.

*Another* Example *of the same.*

In 452 *l.* 17 *s.* 11 *d.* 3 *q.* how many Shillings, nce and Farthings ?

| | *l.* | *s.* | *d.* | *q.* |
|---|---|---|---|---|
| | 452 | 17 | 11 | 3 |

Multiply by 20 the Shillings in a Pound, (add 17

9057 *s.*

Multiply by 12 the Pence in a Shilling, add 11

18115
9058

108695 *d.*

Multiply by 4 the Farthings in a Penny, add 3

434783 Farthings.

In Reduction ascending, if any thing remain after the Division is ended, it is always of the same Denomination with the Dividend, as in the following Example, which may serve as a Proof of the former.

In 434783 Farthings, how many Pounds Shillings, Pence and Farthings.

```
    q.   12) d.      2|0        l.   s.  d. q.
 4) 434783 (108695 (905|7  (452. 17  11 3
    4              108         8
    ----           ----        ---
    034            069         10
    32             60          10
    ----           ----        ---
     27             95         05
     24             84          4
    ----           ----        ---
      38            11 d.      17 s. Remainder.
      36
     ----
      23
      20
     ----
      3 q. remains
```

Here you ſee in dividing the Farthings by 4, ere remains 3, which is 3 Farthings: In dividing 12, there remains 11, which is 11 Pence: In viding by 20, there remains 17, which is 17 illings, which being gathered together, and pla- d by the laſt Quotient, will make 452 *l* 17 *s.* *d.* 3 *q.* as you ſee the Work above, which is ual to the given Number of Farthings.

I have hitherto made uſe of that we call the long y of Multiplying and Dividing by 20, 12 and 4, reaſon of its eaſineſs for a Learner, as being not rthenſome to the Memory; but now I ſhall ſhew u the ſhort way which is very much practis'd of te. And ſince you will often have occaſion to mul- ply and divide by 20, 12, and 4, you will find that is way will be very uſeful to ſhorten the Work.

1. To divide by 4 the ſhort way has been alrea- y taught in Diviſion by one Figure; and need ot be repeated, but proceed to the ſhort way of ultiplication and dividing by 12, for doing of hich you muſt learn the following Table.

| | | | |
|---|---|---|---|
| 12 Times | 2 | is | 24 |
| | 3 | | 36 |
| | 4 | | 48 |
| | 5 | | 60 |
| | 6 | | 72 |
| | 7 | | 84 |
| | 8 | | 96 |
| | 9 | | 108 |

After this Table is got by heart, the manner of ultiplying and dividing by 12 is the ſame as ith a ſingle Figure.

2. To multiply by 12 the ſhort way.

*Example.*

*Example.*

In 654 Shillings how many Pence?

$$\begin{array}{r} s. \\ 654 \\ 12 \\ \hline 7848\ d. \end{array}$$

Here I say, 12 times 4 is 48, set down 8 and carry 4; 12 times 5 is 60, and 4 I carry'd, is 64, set down 4 and crrry 6; 12 times 6 is 72, and 6 I carry'd is 78, which I set down: See the Work above.

3. To divide by 12 the short way.

*Example.*

In 7848 Pence how many Shillings?

$$\begin{array}{l} \quad\ d. \\ 12)\ 7848 \\ \quad\ 654\ \text{Shillings.} \end{array}$$

I say 12 in 78 I can have 6 times; I set down 6 under 8, and say, 6 times 12 is 72, out of 78, and there remains 6, which is 6 Tens, or 60, to be added to the next Figure 4, and it makes 64: Then I say 12 I can have in 64 five times, I set down 5 under 4, and say 5 times 12 is 60, out of 64, and there remains 4, which is 4 Tens, or 40, to be added to the next Figure 8, and it makes 48; Then I say 12 I can have in 48 four times, I set down 4 under 8, and say, 4 times 12 is 48 out of 48, and nothing remains, as by the Work above.

4. To divide by 20 the short way.

*Example.*

Bring 11732 Shillings into Pounds.

$$\begin{array}{l} 2|0)\ \underline{1173|2} \\ li.\ 586—12\ s. \end{array}$$

Here I cut off one Place in the Dividend, and take half the rest, saying, half 11 is 5, and 1 remaining

ining makes the next 17, then half 17 is 8, d 1 remaining makes the next 13; then half 13 6, and 1 remaining, which with the 2 cut off kes 12 *s.* for the remainder, and the Quotient 386 *l.* See the Work above.

Some Examples follow in Reduction of Money, scending and Ascending, done after the short y.

*1. Example Descending.*

In 282 Pounds how many Shillings, Pence and things?

| | |
|---|---|
| *lib.* | |
| 782 | |
| 20 | |
| 15640 | Shillings. |
| 12 | |
| 187680 | Pence. |
| 4 | |
| 750720 | Farthings. |

*2. Example Ascending.*

n 750720 Farthings, how many Pence, Shil s, and Pounds.

4) 750720 Farthings.

12) 187680 Pence.

2|0) 1564|0 Shillings.

Answer 782 Pounds.

This Sum proves the former.

3. Ex.

3. *Examples Descending.*

| | *l.* | *s.* | *d.* | *q,* | |
|---|---|---|---|---|---|
| In | 776 | 15 | 04 | $\frac{3}{4}$ | how many Farthings? |
| | 20 | | | | |

15535 Shillings.
12

186424 Pence.
4

745699 Frrthings.

4 *Example Ascending.*

How many Pounds are there in 745699 Fa[r]things?

4) 745699 $\frac{3}{4}$

12) 186424 *d.*

2|0) 1553|5 *s.*

*l.* 776 15 04 $\frac{3}{4}$.

*Facit* 776 *lb.* 15 *s* 4 *d.* $\frac{3}{4}$ the Proof of the la[st] Example,

To reduce Sterling [ or *English* Money ] in[to] Foreign, and Foreign Coin into *English*.

1. To rduce *English* into Foreign Money.

*The Rule.*

Take the given Sterling, and also the Price [of] one of those Pieces which the Sterling is to b[e] brought into, and reduce them into one Name[.] Then divide one by the other, and the Quotie[nt] answers the Question.

*Examp[le]*

*Example.*

In 426 *l.* 14 . 4 *d.* Sterling, how many Crowns of 57 *d.* $\frac{1}{4}$ *per* Crown.

| *lb.* | *s.* | *d.* | |
|---|---|---|---|
| 426 | 14 | 4 | Sterling. |
| 20 | | | |

8534 *s.*
12

102412 *d*
4

229) 409648 (1788
229::

1806::
1603::

2034:
1832:

2028
1832

196

*d.*
57 $\frac{1}{4}$
4

229 *p.*

Answer, 1788 Crowns.

After the same manner are all the following examples done.

1. In 721 *l.* 17 *s.* 10 *d.* how many Crowns at 58 *d.* $\frac{1}{2}$ *per Crown*?

2. In 461 *l.* 12 *s.* 07. *d.* how many Dollars at 4 *s.* 4 *d.* *per* Dollar?

3. In 2470 *l.* 10 *s.* 11 *d.* how many Guineas at 21 *s.* 6 *d.* *per* Guinea.

2. To reduce Foreign Coin into *English* Money.

*The Rule.*

Multiply the given Numbers of Foreign Pieces by

by the Pence or Farthings, *&c.* that are in the Pri[ce] of one Piece, and it will ſhew you the Pence or Fa[r]things in all the Pieces: Then reduce one Poun[d] Sterling into the ſame Denomination the Forei[gn] Money is brought into, and divide thereby. Th[e] Quotient will give you the Pounds Sterling.

*Example.*

In 7426 Crowns, at 57 *d. per* Crown, how ma[-]ny Pounds Sterling?

Crowns.

| | | | | |
|---|---|---|---|---|
| | | 7426 | | *s.* |
| | Multiply by | 57 | the *d.* of one Piece | 20 |
| | | | | 12 |
| | | 51982 | | |
| | | 37130 | | 240 |
| | | | | *lb.* |
| Divide by 240, the Pence in a Pound. | 24\|0) | 42328\|2 | *d.* | (1763 |
| | | 24 | | |
| | | 183 | | |
| | | 168 | | Anſw, 1763 *l. Sterl.* |
| | | 152 | | |
| | | 144 | | |
| | | 88 | | |
| | | 72 | | |
| | | 6 | | |

The following Examples are done after the ſame manner.

1. In 7426 Crowns, at 58 *d.* ¾ *per* Crown, ho[w] many Pounds Sterling?

2. In 7426 Guineas, at 21 *s.* 6 *d.* how many Pounds Sterling?

3. In 64217 Pieces of Eight, at 4 *s.* 7 *d. p[er]* Piece, how many Pounds Sterling?

Having

Having done with Reduction of Money, I shall go on to the several Weights and Measures which are done after the same manner as this has been, only observing the Notes, and consider how many of one Denomination goes to make one of the next, and to multiply or divide accordingly.

*Reduction of* Avoirdupois-Weight, *Descending and Ascending.*

1. *Example Descending.*

In 742 C. how many *lb* ?

```
                C.
               742
Multipliy by     4 the Quarters in a Hundred.
            ------
Makes         2968 Quarters.
Multipliy by    28 the lb. in a quarter of C.
            ------
             23744
              5936
            ------
Makes        83104 lb. for Answer.
```

Or at one Operation thus.

```
       742
       112
     -----
      1484
      742
     742
     -----
Makes 83104 lb.         C.
                         1
                         4
                        --
                         4 qu.
                        28
                       112 lb.
```

It may not be improper to shew you here how to multiply by 112 in one Line, which is done by this Rule.

Multi-

Multiply by 12, and take in each Figure of th
Multiplicand, beginning to add the first (or Unit
Figure of the Multiplicand, to the Third or Hun
dreds of the Product, and so on.

*As for Example.*

Bring 7423 into Pounds.

```
  112
 ------
 831376 lb.
 ------
```

Say, 12 times 3 is 36, set down 6 and carry
then 12 times 2 is 24, and 3 carry'd, is 27, s
down 7 and carry 2; 12 times 4 is 48, and 2 ca
ry'd, is 50, and 3 (the first Figure of the Mul
plicand) is 53, set down 3 and carry 5; 12 tim
7 is 84, and 5 carry'd, is 89, and 2 (the secon
Figure of the Multiplicand) is 91, set down 1 an
carry 9: Now 9 carry'd and 4 (the third Figu
in the Multiplicand) is 13, set down 3 and car
1; then 1 I carry'd and 7 (the last Figure of t
Multiplicand) is 8: See the Work above.

2. *Example Descending.*

How many C. in 83104 *lb*?

```
      lb.  4)                         Or at one Operati
  28) 83104   (2968                         thus.
      56:::   ----                           C.
   --------  Facit 742 C.      112) 83104 (742
      271::                          784
      252::                         -----
      -----                          470
       190:                          448
       168:                         -----
      -----                          224
        224                          224
        224                         -----
      -----                            0
          0
```

These two Examples prove the former.

3.

### 3. *Example Descending.*

In 856 *C.* 3 *qu.* *lb.* 2 *oz.* how many Ounces
d Drams.

| | *C.* | *qu.* | *lb.* | *oz.* |
|---|---|---|---|---|
| | 856 | 3 | 17 | 2 |

ultipliy by 4 the *qu.* in a C. and take in 3 *qu.*

Makes 3427 *qu.*
ultiply by 28 the *lb.* in a *qu.* of *C.* and take (in 17 *lb.*

27423
6855

Makes 95973 *lb.*
ultiply by 16 the *oz.* in a *lb.* and take in 2 *oz.*

575840
95973

akes 1535570 *oz.*
ultiply by 16 the Drams in an *oz.*

9213420
1535570

akes 24569120 Drams.

4 *Exam.*

### 4. *Example Ascending.*

How many Hundreds, Quarters, Pounds and Ounces are in 24569120 Drams?

```
       dr.  16)     oz     28)   lb.    4)   qu.
16) 24569120  (1535570  (95973  (3427
    16          144        84      ----
    --          ---        --      856 (3
     85          95        119
     80          80        112
     --          --        ---
      56         155        77
      48         144        56
      --         ---        --
       89        117        213
       80        112        196
       --        ---        ---
        91        50        17 lb.
        80        48
        --        --
        112       2 oz.
        112
        ---
         00
```

*Answer.* 856 *C.* 3 *qu.* 17 *lb.* 2 *oz.* the Proof of the last.

*5 Example.*

| | | C. | *qu.* | *lb.* |
|---|---|---|---|---|
| In 27 Hhds. each weighing | | 7 | 2 | 14 |
| ow many *oz.* | | 4 | | |

I reduce the
Veight of 1
hd. into the
enomination
hich the Que-
ion is re-
uir'd to be
ought into,
mely, *oz.*
d then mul.
ly it by 27,
e Number
f hhds. and
e Product
ews the *oz.*
f all the hdds.
r Answer,
you see the
ork.

30 *qu.*
28

244
61

854 *lb.*
16

5124
854

13664 in 1 hhd.
Mult. by 27 hhds.

95648
27328

*Answ.* 368928 *oz.* in all the Hhds.

6. In 472 C. 2 *qu.* 27 *lb.* how many Boxes, ch 64 *lb.* 10 *oz.*

7. How many C. are in 4725 Boxes, each 57 *lb.* *oz.*

8. In 874 C. 3 *qu.* 19 *lb.* How many Hhds, ch 8 C. 2 *qu.* 10 *lb.*

9. How many C. in 78241 hhds. each 10 C. $\frac{3}{4}$ *lb.*

*Reduction of* Troy-Weight. *Descending and Ascending*

1 *Example Descending*.

In 742 *lb.* how many Grains ?

| | | |
|---|---|---|
| | *lb.* 742 | |
| Multiply by | 12 | the Ounces in a Pound Troy |
| Makes | 8904 | Ounces. |
| Multiply by | 20 | the *dw.* in an Ounce. |
| Makes | 178080 | *dw.* |
| Multipliy | 24 | the Grains in a *dw.* |
| | 712320 | |
| | 356160 | |
| Maeks | 4273920 | Grains for Answer. |

Or at one Operation thus.

*lb.*

Bring 742 into Grains.

*Note*, It will somertimes happen that the Number you design to make your Multiplicand hath less Number of Figures than the Multiplier: In this Case (for Contraction sake) you may make the Multiplicand the Multiplier, Truth admitting of such a Change, as in this Example.

| | |
|---|---|
| *lb.* 1 | |
| 12 | |
| 12 *oz.* | |
| 20 | |
| 240 *dw.* | |
| 24 | |
| 960 | |
| 480 | |
| 5760 | Grains in 1 |
| 742 | Numb. of *lb.* |
| 11520 | |
| 23040 | |
| 40320 | |

Answer, 4273820 Grains in 742 *l.*

2 Example Ascending.

How many *lb.* in 4273920 Grains?

```
) 4273920   (17808|0 dw.
  24···2|0
  ------    --------
  187   12)   8904  oz.
  168··     --------
  ------ Answ.  742  lb. or Proof of the last.
   193·     --------
   192
  ------
    192
    132
  ------
     00
```

Or at one Work thus.

```
    Grains.   lb.                   lb.
0) 4273920 (742 for Answ.           1
   40320··                         12
   --------                       ----
   24192·                          12 oz.
   23040·                          20
   --------                       ----
    11520                         240 dw.
    11520                          24
   --------                       ----
        0                         960
                                 480
                                 -----
                                 5760 gr. in 1 lb.
```

These two last ways Ascending, prove the two
mer Descending.

3 Example Descending.

In 49 Pounds, 11 Ounces, 19 Penny-weight,
23 Grains *Troy*, how many Ounces, Penny-
ight and Grains?

*lb.*

*lb.* *oz.* *dw.* *qu.*
49 : 11 : 19 : 23
Multiply by 12 the *oz.* in a *lb.* and take in 11

Makes 599 *oz.*
Multiply by 20 the *dw.* in an *oz.* and take in 19

Makes 11999 *dw.*
Multiply by 24 the *gr.* in a *dw.* and take in 23

47999
24000

287999 Grains for Answer.

4 *Example Ascending.*

How many Pounds, Ounces, Penny-weight and Grains are in 287999 Grains?

Grains
24) 287999 (11999|9 (
24 :: 2|0

47 : 12) 599 19 *dw.*
24 :
*lb.* 49 11 *oz.*
239
216

239
216

23 Grains.

*Answ.* *lb.* 49 *oz.* 11 *dw.* 19

*Example* 7. *lb. oz. dw.*

In 12 Ing. of Silver, each 3 0 14
ⅼ many Grains ? 12

46 *oz.*

Bring the Weight 20
f one Ingot into
rains, then mul- 934 *dw.*
ply them by 12; 24
e Number of In-
ots, and the Pro- 3736
ucts shews the 1868
rains of all the
ngots for Answer. 22416 gr. in 1 Ingot.

12 Ingots.

168992 gr. in all the Ing.

*Reduction of* Cloth-Measure, *Descending and Ascending.*

*Example* 1.

In 47 Yards, 2 Quarters, 3 Nails, how many uarters and Nails ?

*Yds. qu. Nls.*
47 2 3
4

190 qu.
4

*cit* 763 Nails.

*Example* 2.

How many Yards, Quarters, and Nails in 763 ails ?

4 ) 763 (

4 ) 190 3 Nails.

*Answ.* 47 Yds. 2 Qu. 3 Nls.

*Example* 3.

In 426 Ells *English*, 3 Quarters, 3 Nails, how many Nails?

*Ells Eng. qu. Nls.*
426 3
5
———
2133 Quarters.
4
———
*Answ.* 8532 Nails

*Example* 4.

How many Ells *English*, Quarters and Nails, are in 8515 Nails?

4) 8535 (
———
5) 2133 ( 3 *Nls.*
———
*Facit* Ells 426 3 qu. 3 Nls.

*Example* 5.

In 842 Ells *Flemish*, 2 Quarters, 2 Nails, how many Nails?

*Ells Fl. qu. Nls.*
842 2 2
3
———
1528 Quarters.
4
———
10114 Nails.

*Example* 6.

How many Ells *Flemish*, Quarters and Nails in 10114 Nails?

4) 10114 (
———
3) 2528 ( 2 Nails.
———
*Facit* Ells *Flemish* 842 2 qu. 2 Nls.

*Example* 7.

In 27 Pieces, each 28 *Yds.* 2 *qu.* 2 *Nails*, how [m]any *Nails* ?

The Measure of one Piece.

| Piece | *Yds.* | *qu.* | *Nls.* |
|---|---|---|---|
| 27 | 28 | 2 | 2 |

Reduce the Measure [of] one Piece into Nails, [th]en multiply by the [N]umber of Pieces, and [th]e Product gives you [th]e Nails in all the [P]ieces for Answer.

```
  28   2   2
   4
 ----
 114 qu.
 ----
   4
 458 Nls. in a Piece.
  27 Pieces.
 ----
 3206
 916
 -----
 12366 Nls. in 27 Pieces
               for Answer.
```

8 In 274 Ells *Eng.* how many Ells *Flem.*

9 How many Ells *Eng.* in 74272 Ells *Flem.*

10 In 742 Yards, how many Ells *Eng.*

11 How many Yards in 7425 Ells *Eng.*

12 In 742 Ells *Flem.* how many Yards ?

*Reduction of* Liquid-Measure, *Descending and Ascending.*

*Example* 1.

In 742 Tons how many Gallons ?

```
                    Or thus,
    742
      4
  ------          742 Tons.          Tons.
   2968 Hhds.     252                  1
     63          -----                 4 Hhd.
  ------          1484               -----
   8904          3710                  4
  17808          1484                 63
  ------         ------              -----
 186984 Gal.    186984 Gall.         252 Gall.
```

In 186984 Gallons, how many Tons?

```
             4)
63 ( 186984 ( 2968
     126                      742 Ton.
     ---
      609
      567
      ---
       428
       378
       ---
        504
        504
        ---
          0
```

Or thus,

```
                 Tons
252) 186984 (742
     1764
     ----
      1058
      1008
      ----
       504
       504
       ---
         0
```

*Example* 2.

```
Tons, Hhds. Gall.
654 : 3 : 28   how many Pints?
  4
-----
2619 Hhds.
  63
-----
 7865
15716
-----
165025 Gallons.
     8
-------
1320200 Pints for Answer.
```

*Example.*

How many Tons, Hhds. and Gallons are in 1320200 Pints.

```
1320200 Pints.
——————— 4)
165025 (2619
126 . . ———
——Tons 654 3 Hhds. 28 Gall.
 390 . .  ————
 378 . .
 ———
  122 .
   63 .
 ———
  595
  567
  ——
  28 Gallons.
```

*Example* 4.

5. How many Quart Bottles can I fill out of 3 Hhds. of Wine, 63 Gallons?

*Reduction of* Land *or* Long-Measure, *Descending and Ascending.*

*Example* 1.

How many Barley-corns will reach from *London* to *York*, being 150 Miles?

```
        8
   ————
   1200 Furlongs.
     40
   —————
  48000 Perches.
     33
  ——————
 144000
144000
—————
1584000 half Feet.
      6
———————
9504000 Inches.
      3
```

Answer, 2851200 Barley-corns.

### *Example* 2.

The Circumference of the Earth being 360 grees, and each Degree 60 *English* Miles, I mand how many Miles, Furlongs, Perches, Inc and Barley-corns will reach round the World

360 Degrees.
60 Miles in a Degree.

---

21600 Miles about the Earth.
8 Furlongs in a Mile.

---

172800 Furlongs about the Earth.
40 Perches in a Furlong.

---

6912000 Perches about the Earth.
33 half Feet in a Perch.

---

20736000
20736000

---

228096000 half Feet about the Earth.
6 Inches in a half Foot.

---

1368576000 Inches about the Earth.
3 Barley-corns in an Inch.

---

*Answer.*
4105728000 Barley-corns about the Earth.

## *Reduction of* Time *Descending and Ascending.*

1. In 35 Years, 123 Days, 21 Hours and 46
inutes, how many Days, Hours and Minutes?

Years. Days. Hours. Min.
35 133 21 46
365 Days in a Year.

178
212
106

12898 Days.
24

51593
25798

309573 Hours.
60

18574426 Minutes.

2. How many Years, Days, Hours and Mi-
ites are in 18574426 Minutes?

6|0) 1857442|6 (46 Minutes.

(365 Days, Hours, Min.
4)309573 (12898(35 Years, 123 21 46
24.... 1095.

69... 1948
48... 1825

215.. 123 Days.
192..

237
216

213
192

21 Hours.



3. How

3. How many Days, Hours, and Minutes since the Birth of our Saviour *Jesus Christ* to the present Year 1710.

| | | | |
|---|---|---|---|
| 1715 | Years. | | |
| 365 | Days in a Year. | | |
| 8575 | | | |
| 10290 | | | |
| 5145 | | | |
| 625975 | Days since the Birth of Christ. | | |
| 24 | | | |
| 2503900 | | 1715 | |
| 1251950 | | 6 | |
| 15023400 | | 10290 | Hours |
| 10290 | Hours added. | | |
| 15033690 | Hours since the Birth of Christ. | | |
| 60 | | | |
| | *Answer.* | | |
| 902021400 | Minutes since the Birth of Christ. | | |

*Note*, the reckoning but 365 Days to the Year, there is 6 Hours lost in every Year; to correct which you must multiply the Number of Years to be reduced by 6, and the Product will give you the Hours to be added, as you may see done in the Example above.

7. Admit it were 5807 Years since the World was made, how many Minutes it is since the Creation of the World?

CHAP.

# CHAP. VIII.

## the GOLDEN RULE, or, RULE OF THREE.

THIS Rule is call'd the *Golden Rule* from its excellency, it being the most useful Rule Arithmetick: And it is call'd the *Rule of Three*, ause it has always three *Numbers* given, by the of which to find out a fourth Number sought.

I. These Numbers are commonly call'd Terms; he first, second, third, and fourth Term.

II. This Rule is of two Kinds, Single and uble.

V. Again, Each of these is of two Kinds, Di and Reverse. I shall speak of each in their ler, and first of the *Golden Rule Direct*.

V. The *Golden Rule Direct* is when 3 Numbers given to find out a fourth in *Direct Proportion*; is, when the *fourth* Term [or Number] ht to bear the same Proportion to the *third*, that *second* doth to the *first*, or as the *first* Term is proportion to the *second*, so is the *third* to the *th*, which may be better explain'd (in other rds) thus; when the *fourth* Term ought to con the *third* just so many times as the *second* con- s the *first*; or when the *fourth* Term ought to contain'd by the *third* just as often as the *second* ontain'd by the *first*: this is call'd the Direct e, and is resolv'd thus.

Multiply the *second* Term by the *third* (or is the same thing) multiply the *third* Term he *second*, and divide the Product by the *first*, Quotient shall be the *fourth* Term sought, or wer to the Question.

*Example.*

*Quest.* 1. If 4 Yards of Cloth cost 12 *s.* w
will 6 Yards cost at that rate?

| | | | |
|---|---|---|---|
| Yds, | *s.* | Yds. | |
| If 4 cost | 12 | what cost 6 | |
| | | 6 | (*Anſ.* 18 *s.* |
| | | — | |
| | 4) | 72 ( | |
| | | — | |
| *Anſw.* | 18 *s.* | | |

Here I place the N ber as in the Marg then I multiply 12 b and the Product is which I divide by 4, the Quotient is 18, w is the fourth Term fo or Anſwer to the Que on.

Thus have I explain'd the Nature of the Gol Rule Direct, and ſhewn, in general, how to w it; but all the Difficulty in the Golden Rule lie placing the three given Terms or Numbers in t right Order, fit for Work (for many times Queſtion is ſo intricately ſtated, as 'tis no eaſy m ter to know which is the firſt Term, which ſecond, and which the third)

Therefore, when a Queſtion is propos'd in Golden Rule, the firſt thing you do muſt be place the three given Terms, or Numbers, in th right order; that is, you muſt find which is yo firſt Term, which your ſecond, and which yo third. To do which you muſt know, That,

Of the 3 Terms given, 2 of them are call'd *Ter of Suppoſition*, becauſe they ſuppoſe a Queſtion w its Anſwer; and the other Term is call'd the *Te of Demand*, becauſe it demands an Anſwer to Queſtion: It is alſo eaſily known by theſe, or like Words going before it, *How many*, *how mu what coſt*, &c.

This being known, let the *Term of Deman* (always) the third Term, and of the two Te remaining, let that which is of the ſame Deno nation with the *Term of Demand* be the firſt Ter

nd then the remaining Term must be the second ſerm, For

*Example.*

If 6 *lb*. of Sugar coſt 3 *s*. what coſts 9 *lb*.

In this Queſtion the Suppoſition is, if 6 *lb*. coſt *s*. and the Demand is, what 9 *lb*. coſt: Now be-uſe the Demand lies on the Number 9, there-re 9 muſt be the third Term, which for clear-ſs ſake I put down.

Thus.

| ſt Term. | 2d. Term. | 3d. Term. |
|---|---|---|
| | | *lb*. |
| | | 9 |

Here 9 being put, according to order, in the l Term, I conſider next which of the other two umbers is of the ſame kind or Nature with 9, at is, 9 being ſo many *lb*. weight, I muſt exa-ine which of the other two Numbers bear the enomination or Name of Weight, which I find oes fall on the Number 6, that being *lb*. weight well as the Number 9 is *lb*. weight, wherefore place 6 in the firſt Term.

Thus.

| ſt Term. | 2d. Term. | 3d. Term |
|---|---|---|
| *lb*. | | *lb*. |
| 6 | | 9 |

And then it conſequently follows, that the re-aining Term 3 *s*. muſt be the ſecond Term, and en it will ſtand

Thus,

| ſt. Term. | 2d. Term. | 3d. Term. |
|---|---|---|
| *lb*. | *s*. | *lb*. |
| 6 | 3 | 9 |

That is, If 6 *lb*. coſt 3 *s*. what coſt 9 *lb*.

Theſe things obſerv'd, you connot miſs of pla-ng the Terms right; which being done, the xt thing is to know how to work it, (in order

to

to find the Anſwer to the Queſtion) to do wh[…]
This is the Rule.

Multiply the 2d Term by the 3d. (or the […] by the 2d.) and divide the Product by the fi[…] ſo the Quotient ſhall be the Anſwer to the Q[…]ſtion.

*Example.*

Q. 3. If 4 Yds. coſt 9 *s.* what coſt 8 Yds.

Multiply by 9 the 2d. Ter[…]

```
                                     ——
Divide by the firſt Term 4) 72 (18 s. Anſ[…]
                            4
                            —
                            32
                            32
                            —
                            0
```

**Or thus,**

If 4 Yards coſt 9 *s.* what coſt 8 Yd[…]

Multiply by 8 the 3d Term.

```
                          ——
Divide by the 1ſt Term 4) 72 (18 s. Anſwer.
                          4
                          —
                          32
                          32
                          —
                          0
```

*Note,* That the Anſwer to the Queſtion (th[…] is the Quotient of the Diviſion by the firſt Term) is always in the ſame Denomination, or Name, that the ſecond Term is of, or is reduced to; a[…] you may ſee in the Example above, where you will find the Anſwer is 18, which is the ſame Name as the 2d Term (9) is of, that is, Shillings.

Many times the ſecond Term (or Number) will conſiſt of divers Denominations, as Pounds and Shil-

llings, or Shillings and Pence, or Pounds, Shil-
gs and Pence, *&c.* In this Case you must reduce
o the lowest Denomination mention'd, (or low-
f you please) by Sect. 12. of Chap. 7. and then
ltiply and divide, as before directed.

*Example.*

*Quest.* 4. If 18 Yards of Camlet cost 3 *lb.* 12 *s.*
at will 596 Yards cost at that rate?
Here the second Term consisting of divers De-
minations, I reduce it to the least mention'd,
nely, Shillings, and it makes 72 *s.* which I mul-
ly by 596 (the 3d Term) and the Product is
912, which being divided by 18 (the first Term)
Quotient is 2384 *s.* which is the 4th Term, or
swer to the Question. See the whole Operati-
as followeth.

```
Yds.   lb.  s.              Yds.
f 18 cost 3  12 what cost   596
          20                 72
          --               -----
          72               1192
                          4172
                          -----    s.
                     18) 42912  (2384 Answer
                         36...   which divide
                         --...   by 20, by cut-
                          69..   ting off the last
                          54..   Figure, and ta-
                          --..   king half the
                          151.   rest makes
                          144.   lb.  s.
                         -----   119  4
                            72   for Answer.
                            72
                            --
```

VII. It

VII. It also many times happens in the Gold[en] Rule, that tho' the first and third Terms be ( they must always be) of the same kind, as, bo[th] Money, both Weight, or both Measure, *&c.* [y]et either *one* or *both* of them may consist of divers D[e]nominations, as was said before of the 2d Term. In this Case they must both be reduced to o[ne] Denomination, and that the least mentioned, [or] lower if you please; which being done, multip[ly] and divide as before directed.

*Example.*

*Quest.* 5. If 24 *lb.* of Raisins cost 8 *s.* what sh[all] 1 *C.* 2 *q.* 24 *lb.* cost? Answer, 64 *s.* See the Op[e]ration.

| | | | |
|---|---|---|---|
| | *C.* | *qu.* | *lb.* |
| If 24 *lb.* cost 8 *s.* what cost | 1 | 2 | 24 |

```
          1
          4
        ----
          6 qu.
         28
        ----
         52
        14
        ----
        192 lb.
          8
        ----
 24) 1536 ( 64 s.  Answer.
     144
     ----
       96
       96
     ----
        0
```

*Quest.* 6. If 1 C. 1 *qu.* 13 *lb.* of Sugar cost 51 [s.] what will 6 C. 3 *qu.* 9 *lb.* cost at that rate? *An[swer]* 255 *s.* See the Operation as follows.

```
C. qu. lb.                          C. qu. lb.
1  1  13  cost 51 what cost  6  3  9
4                                4
--                             ---
5 q.                            27 q.
28                              28
--                             ---
43                             225
11                              54
--                            ----
153 lb.                        765 lb.
                                51
                              ----
                               765
                              3825
                            ------
                   153) 39015 (255 s. Ansf.
                        306
                        ---
                         841
                         765
                         ---
                          765
                          765
                          ---
                            0
```

Sometimes it happens, that all the three (given) Terms consist of divers Denominations: In this case (also) they must each of them be reduced to the least Denomination mention'd; but be sure that the first and third Terms be reduced to the same Denomination; then work as before.

*Example.*

*Quest.* 7. If 9 C. 1 *q.* 14 *lb.* of Raisins cost 9 *l.* 1 *s.* what will 6 C. 3 *q.* 20 *lb.* of the same cost? *Answ.* 19 *l.* 8 *s.* See the Operation as follows.

If

```
     C.  q.  lb.        l.  s.            C.  q.  lb.
If   3   1   14   cost  9   9   what cost 6   3   20
     4                 20                 4
    ---               ----               ---
    13 qrs.           189 s.              27 qr.
    28                                    28
   ----                                  ----
   108                                   216
   27                                    56
   ----                                  ----
   278 lb.                               776 lb.
                                         189 s.
                                        ------
                                         6984
                                        6208
                                        776
                                       -------  2|0     l.  s.
                                 378) 146664 (38|8 (19  8
                                      1134      2
                                      ----     --
                                       3326    18
                                       3024    18
                                       ----    --
                                        3024    0
                                        3024
                                        ----
                                           0
```

When you have multiplied the *second* Term by the *third*, and divided the Product by the *first* Term: If then any thing remain after the Division is ended, it is part of a Unit in the Quotient, and its Value may be found out thus:

Multiply the said Remainder by the Parts of the next lesser Denomination that are equal to a Unit in the Quotient, and divide the Product by the first Divisor, so the Quotient shall be the Value of the said Remainder in the said Parts; and if any

thing yet remain, multiply it by the Parts of next lesser Denomination that are equal to a it in the last Quotient, and divide the Product the same Divisor as before, so the Quotient ll be the value of the last Remainder in the last ts. Proceed thus till you have brought it as as you desire, and if any thing remain at the of all, it is part of a Unit in the last Quotient, must be placed over a Line, with the Divisor der it, as is done in the Question following.

*Quest*. 8. If 13 Yards of Velvet cost 21 *l.* what l 27 Yards of the same cost at that rate; *Answ.* *l.* 12 *s.* 3 *d.* 2 *q.* $\frac{10}{13}$, that is, 43 Pounds 12 llings and 3 Pence 2 Farthings, and 10 Parts 13 of a Farthing, which is a little above three rters of a Farthing. See the Work as follows.

If

If 13 Yards cost 21 *l.* what cost 27 Yards?

```
          27
        ----
         147
         42
        ----    l.  s.  d. q.
   13 ) 567 (43  12  3  2 10/13.
        52
        ----
         47
         39
        ----
          8 Pounds remain.
         20 Shillings in a Pound.
        ----
   13 ) 160 (12 s.
        13
        ----
         30
         26
        ----
          4 Shillings remain.
         12 Pence in a Shilling.
        ----
   13 ) 48 ( 3 Pence.
        39
        ----
         9 Pence remain.
         4 Farthings in a Penny.
        ----
   13 ) 36 (2 qu.
        26
        ----          10/13
        10
```

Anſwer, 12 *s.* 3 *d.* 2 *q.* $\frac{10}{13}$.

*Quest.* 9. Bought 6 Hhds. of Tobacco, each [we]ighing 5 C. 2 *q*. 17 *lb.* at 3 *l.* 10 *s.* 4 *d. per* [C.] What is the Value of the 6 Hhds. at that [Rat]e?

To do this, you must first find the Weight of the [6] Hhds. ; which is done by reducing the Weight [of] one of them into Pounds, and multiply them [by] 6 (the number of Hhds) and they make 3798 *lb.* [T]hen say, If 1 C. or 112 *lb.* cost 3 *l.* 10 *s.* 4 *d.* [wh]at will 633 *lb.* cost? *Answ.* 118 *l.* 13 *s.* 9 *d*, as [by] the Operation.

[T]he Weight of 1 Hhd is 5 C. 3 *qu.* 17 *lb.*
Multiply by 4 qu. in a Hundred.

Makes 22 *qu.*
Multiply by 28 *lb.* in a Qu. of a Hund.

183
45

Makes 633 *lb.* weight of 1 Hhd.
Multiply by 6 Hhds the Num. of Hhds.

Makes 3798 *lb.* in 6 Hhds.

If

Then say,

| | *lb.* | | *l.* | *s.* | *d.* | | *lb.* |
|---|---|---|---|---|---|---|---|
| If | 112 | cost | 3 | 10 | 4 | what will | 3798 |

```
      20                          840
     ----                       -------
      70 s.                     151920
      12                        30384
     ----                       -------          d.
     140                112 ) 3190320 ( 28485
      70                        224....
     ----                       -------
     840 d.                      950...
                                 896...
               2|0              -------
12) 28485 (237|3                  543..
    24...  ------                 448..
    ----   118 13 d.             -------
     44..                          952.
     36..                          896.
    ----                         -------
     88.                            560
     84.                            560
    ----                         -------
     45                               0
     36
    ----                       l.   s.   d.
     9 d.               Answ. 118   13   9
```

*Quest.* 10. What is the Amount of 8 Ingots Silver, each weighing 4 *lb.* 10 *oz.* 12 *dw.* at 2 *d. per oz.*?

Reduce the Weight of 1 Ingot into the low Name mentioned, that is *dw.* and multiply th by 8 (the Number of Ingots) which will sh you the *dw.* in all the Ingots; as thus :

| | | lb. | oz. | dw. |
|---|---|---|---|---|
| he Weight of 1 Ingot is | | 4 | 10 | 12 |
| Multiply by | | 12 oz. in a Pound. | | |
| Makes | | 58 oz. | | |
| Multiply'd by | | 20 dw. in an oz. | | |
| Makes | | 1160 dw. in 1 Ingot. | | |
| Multiply'd by | | 8 Ingots, | | |
| Makes | | 9280 dw. in 8 Ingots. | | |

Then say,

| | s. | d. | | dw. |
|---|---|---|---|---|
| cost | 5 | 2 | what cost | 9280 |
| | 12 | | | 62 |
| dw. | 62 d. | | | 18560 |
| | | | | 55680 |

```
                 12          20
2|0) 57536|0 (28768 ( 2391|7
     4...      24...    ------
     ----      -----    119|7
     17...     47
per, 119 17 04     16...     36..
lib.  s.  d.       ----      -----
     15..      116.
     14..      108.
     ----      -----
     13.       88
     12.       84
     ----      ----
     16        4 d.
     16
     --
     0
```

Quest. 11. Unto how much comes 12 Pieces of ...land, each Piece containing 27 Ells $\frac{2}{5}$, at 6 s. per Ell. See the Work as follows. Ells.

Ells.

1 Piece contains $27\frac{1}{5}$

Multiply by 5 quarters in 1 Ell.

makes 136 quarters in 1 Piece.

Multiply by 12 the Number of Pieces.

272

136

makes 1632 quarters in all the Pieces.

Then say,

*Ell.* *s.* *d.* *quarters.*

If 1 cost 6 6, what will 1632 cost?

5 12 78

5 *qr.* 78 *d.* 13056

11424

5 ) 127296 ( 25459

10····

2|0

12) 25459 ( 233|18 ( 27···

24··· 25···

*l.* *s.*

14·· 116 18 22··

12·· 20··

45· 29·

36· 25·

99 46

96 45

*l.* *s.* *d.*

3 *d.* *Ans.* 116 18 $3\frac{1}{5}$ 1

*Quest.* 12. If a Hhd. of Sugar, weighing 3 *qu.* 17 *lb.* cost 16 *l.* 18 6 *d.* what will cost at that rate? See the Work.

| C. | q. | lb. | | l. | s. | d. | | lb. | |
|---|---|---|---|---|---|---|---|---|---|
| 6 | 3 | 17 | cost | 16 | 18 | 6 | what will | 1 | cost? |

4 | 20

27 q. | 338 s.
28 | 12

3 | 682
| 338

lb. 773) 4062 (5 d. 2 q. $\frac{42}{773}$.
3665

397
4

773) 1588 (2 q. $\frac{42}{773}$.
1546

42 *Answer*, 5 *d.* 2 *q.* $\frac{42}{773}$.

*te*, That to multiply or divide any Number , is a needless Trouble, because it brings the ber that is multiplied or divided by it to the as it was before; for which reason in the mple above, I did not multiply the second ber 4062 by the third Number 1, because it ld have made it the same, as you may see by Work.

4062
1

4062

he *Golden Rule Direct* is thus prov'd: Multi- he 1st Term by the 4th, and note the Product; multiply the 2d Term by the 3d, and if this duct be equal to the former Product, then is Work performed right, otherwise not, as in first Question of this Chapter, namely,

4 Yards cost 12 s. what will 6 Yards cost? Answer is 18 s. Now

Now the Product of 4 (the first Term) by 18 (the 4th Term) is 72, which is equal to the Product of 12 (the 2d Term) by 6 (the third Term) and therefore I conclude the Work is right. the Operation.

| Yds. | s. | | Yds. | | s. |
|---|---|---|---|---|---|
| If 4 cost | 12 | what cost | 6, | *Answ.* | 18. |
| | 6 | | | | 4 |
| | — | | | | — |
| | 72 | equal to | | — | 72 |

Note, if any thing remain after Division by Rule, that Remainder must be added to the Product of the first and 4th Terms, so the Sum be equal to the Product of the other two Terms if the Work be done right, else not.

*Questions to exercise the Learner in the* Golden Rule Direct.

1. If 16 Ells cost 2 *l.* 14 *s.* 10 *d.* what cost Ells?

2. To what comes 42 C. ¾ 14 *lb.* of Hops 1 *s.* 2 *d. per lb.*

3. What must I have for 27 *oz.* of Silver, 2 *d. per oz.*

4. If Tobacco is 2 *s.* 4 *d. per lb.* what quantity can I buy for 100 Guineas?

5. At 2 *s.* 4 *d. per* Quart, unto how much come 5 Pipes of Wine?

6. I demand the Amount of 84 Ells ⅕ of land, at 6 *s.* 7 *d.* ¼ *per* Ell?

7. At 4 *l.* 17 *s.* 10 *d. per* C. how much 47 *C.* ¾ 77 *lb.* amount to?

8. What is the Worth of 567 *C.* ¾ 10 *lb.* of gar, at 3 *l.* 12 *s.* 7 *d. per C.*

9. To how much comes 47 Barrels, each ¾ 27 *lb.* at 4 *l.* 18 *s.* 9 *d. per C.*

10. What is the amount of 18 Packs of Cloth each 15 Pieces at 12 *l.* 17 *s.* 4 *d. per* Piece?

. I demand the Amount of 18 Butts of Cur-
, each 11 *C.* $\frac{3}{4}$ 19 *lb.* at 2 *l.* 18 *s.* 11 *d. per C.*
. Sold 15 Hhds of *French* Wine, at 147 *l.* 15 *s.*
*on*: What doth the 15 Hhds amount to at
rate?
3. How many Yards of Muslin at 7 *s.* 6 *d. per*
d, must I have for 150 *French* Crowns, at 57 *d.*
r Crown.
4. Sold 47 Bales of Silk, each 17 *lb.* 11 *oz.* at
. 10 *d.* $\frac{1}{4}$ *per lb.* What do they amount to?
5. I demand the Amount of 1 C. when 20
ts, each 14 *C.* $\frac{3}{4}$ 17 *lb.* cost me 560 *l.* 15 *s.* 6 *d.*
6. Sold 36 dozen, 8 pair of Stockings, at 3 *s.*
*per* Pair; What do they amount to?
7. At 157 *l.* 17 *s.* 6 *d. per* Ton, What is that
Gallon?
8. What must I have for 35 Hhds of Sugar,
h 4 *C.* $\frac{3}{4}$ 17 *lb.* to gain 3 *d.* $\frac{1}{2}$ *per lb.* when it cost
me 6 *d.* $\frac{1}{4}$ *per lb.*
19. If Coffee be 8 *d.* $\frac{1}{4}$ *per oz.* What will 3 *C.*
ight cost at that rate?
20. Bought an Estate of 35 *l.* 10 *s. per Annum*,
r the rate of 18 Years $\frac{1}{4}$ Purchase, What comes
to?
21. How many Gallons of *French* Brandy, at
. 6 *d. per* Gallon, shall I have for 36 dozen of
ockings, at 34 *d. per* Pair?
22. A Gentleman bought a piece of Land for
00 *l.* how must he set it *per Annum*, after the rate
20 Years Purchase.
23. If 120 Eggs are bought at 2 a penny, and
0 more at 3 a penny, and the same 240 sold a-
in at 5 for 2 *d.* The Question is, What is gain'd
lost by them?
24. What Quantity of Tobacco, at 3 *l.* 17. 10 *d.*
*C.* can I have in Exchange for 27 Pieces of
oad Cloth, each piece containing 38 Yards $\frac{1}{4}$
15 *s.* 6 *d. per* Yard?

25. A Merchant hath owing him 748 *l.* 1
10 *d.* and in part of Payment received 940 D
lars, at 4 *s.* 4 *d.* $\frac{1}{4}$ *per* Dollar, and 100 Pieces o
each 4 *s.* 5 *d.* $\frac{3}{4}$, What remains unpaid of
Debt?

26. *A.* oweth to *B.* 250 *l.* 17 *s.* 6 *d.* to *C.* 4
15 *s.* to *D.* 974 *l.* 18 *s.* 4 *d.* to *E.* 867 *l.* 19 *s.* 1
And proving a Bankrupt, compoundeth with
Creditors for 5 *s.* 6 *d.* in the Pound, I dem
what each Man must receive, according to
Composition?

27. A Merchant bought 12 12 Butts of C
rants, each weighing 10 C. $\frac{3}{4}$ 17 *lb.* at 2 *l.* 12 *s.*
*per* C. paid Custom 12 *s.* 6 *d.* *per* C. What cost
12 Butts, and how must he sell them *per* C. to g
50 *l.* by the whole?

28. Delivered to my Factor 7407 *l.* 10 *s.* to
disposed of as followeth, (*viz.*) 200 *l.* 15 *s.*
Tobacco, at 3 *l.* 17 *s.* 6 *d.* *per* C. 890 *l.* 10 *s.*
Sugar, at 2 *l.* 12 *s.* 4 *d.* *per* C. the rest of the M
ney in Wine, at 52 *l.* 16 *s.* *per* Pipe. *Qu.* H
much of each must be received?

29. My Correspondent owes me 2784 Crown
each 57 *d.* $\frac{1}{4}$. He hath remitted me 500 Crow
at 57 *d.* $\frac{3}{4}$ *per* Crown: I have drawn a Bill up
him for 300 Crowns, at 4 *s.* 6 *d.* $\frac{3}{4}$ *per* Crown: H
hath sent me Goods, the Cost and Charges wher
of are, as *per* Invoice, 740 Crowns, at 58 *d.* $\frac{1}{2}$ p
Crown. Now Ballance this Accompt, and t
me what remains in his Hands.

CHAP

# CHAP. IX.

## Of the GOLDEN RULE, REVERSE.

THE *Golden Rule Reverse*, is, when three Numbers are given, to find a fourth in a *reciprocal* ...portion, inverted to the Proportion given; that ... when the *fourth* Term ought to bear the same ...oportion to the *second* that the *first* doth to the ...ird; or as the *third* Term is in Proportion to ...e *first*, so is the *second* to the *fourth*; which may ... explain'd (in other Words) thus: When the ...rth Term ought to contain the *second*, just so ...any times as the *first* contains the *third*; or when ...e *fourth* Term ought to be contained by the *se*...*d*, just so often as the *first* is contained by the ...ird: This is called the Reverse Rule, and is re...lved thus.

Multiply the *first* Term by the *second* (or, which ...all one, multiply the *second* Term by the *first*) ...d divide the Product by the *third*; so the Quo...ent shall be the *fourth* Term sought, or Answer ... the Question.

*Example.*

*Quest.* 1. If 8 Men do a piece of Work in 12 ...ays, in how many Days shall 16 Men do the ...me Piece of Work? *Answ.* 6 Days.

But before I proceed to the Work, it will be ...nvenient for you to note, that in all the fol...wing Cases you must do as in the *Golden Rule* ...irect, (*viz.*)

(1.) In placing the 3 Numbers, or Terms, in ...ght order.

(2.) In Reducing the first, second or third ...erms (when the Question requires it.)

(3) In the Quotient of your Division, by third Term (or Answer to the Question, &c.)

(4) When any thing remains after Division ended.

I say, in all these Cases you must observe same Rules, and proceed after the same manner taught before, in the Golden Rule Direct; (which is the same thing) Note, That there no other difference in the Proceedings of this R and the Golden Rule Direct than this.

That whereas in the Golden Rule Direct (wh the 3 Terms are placed in right order) you m tiply the 2d Term by the 3d (or the 3d by 2d) and divide the Product by the first Term: contrariwise, in this Rule you multiply the fi Term by the 2d, or the 2d by the first, and divi the Product by the 3d Term.

In all other things you follow the Direction la down in the Golden Rule Direct, (mentioned the 4 Cases above) except in the Proof of th Rule, which shall be taught in its proper place.

Having premised this, I proceed to the Opera tion of the Question proposed, which I shall he again rehearse.

*Quest*. If 8 Men do a piece of Work in 12 day in how many days shall 16 Men do the same piec of Work? *Answ*. 6 days. See the Work as fo loweth.

| Men, | Days, | | Men. | |
|---|---|---|---|---|
| If 8 require | 12 | how many will | 16 | require? |
| | 8 | | | |

16) 96 (6
    96

0     *Answer*, 6 Days

Here I place the Numbers, as above, and then, (according to the Rule) I multiply 12 (the second Term) by 8 (the first Term) and the Product is which I divide by 16 (the third Term) and the Quotient is 6, which is the 4th Term sought, Answer to the Question.

When a Question is proposed in the Golden Rule, to know whether it is to be answered by the Direct or *Reverse* Rule; your Reason will tell you, if you observe the following Rule, namely,

If your Reason tell you, that the *bigger* the 3d Term is, the *bigger* the 4th Term must be: Or, that the *lesser* the 3d Term is, the *lesser* the 4th Term must be; then the Question is in the Direct Rule.

*Example.*

If 4 Yds. cost 9 *s.* what cost 8 Yds. *Answ.* 18 *s.*

Here in this Example, 8 the third Term is bigger than 4 the *first* Term; and Reason tells me, it will require a *bigger* Answer than the *first* Term; (for 8 Yards will cost more than 4) therefore the bigger the 3d Term is, the *bigger* the 4th Term must be, (or more requires more) therefore this Question is in the Direct Rule.

Again,

If 18 *s.* buy 8 Yards, how many will 9 *s.* buy? *Answer*, 4 Yards.

Here 9, the third Term, is less than 18, the first Term, and Reason tells me it will require a *less* Answer than the first Term (for 9 *s.* will not buy so many Yards as 18 *s.*) therefore the *lesser* the 3d Term is, the *lesser* the 4th Term must be; (or less requires less) therefore this Question is also in the Direct Rule.

But if your Reason tell you, that the *bigger* the 3d Term is, the *lesser* the 4th Term must be; or,

That the *lesser* the 3d Term is, the *bigger* the 4th Term must be; then the Question is in the Reverse Rule.

*Example.*

If 8 Men require 12 Days, how many will 16 Men require? *Answ.* 6 Men.

Here 16, the third Term, is bigger than 8 the first Term; but Reason tells me it will require a lesser Answer than the first Term: (for 16 Men will do the Work in less time than 8 Men) therefore here the bigger the third Term is, the lesser the fourth Term must be (or more requires less;) therefore this Question is in the Reverse Rule.

Again,

If 12 Days require 8 Men, how many will 6 Days require? *Answ.* 16 Men.

In this Example, 6 the third Term, is less than 12 the first Term: Yet Reason tells me, it will require a *bigger* Answer than the first Term (for there must be more Men to do the Work in 6 Days than in 12) therefore here the lesser the 3d Term is, the *bigger* the 4th Term must be (or less requires more) therefore the Question is also in the Reverse Rule.

These Rules (for the Memory's sake) may be comprised in the two following Distichs, *viz.*

*If* more *do* more, *or* less *do* less *respect*,
*It is a Question in the* Rule Direct:
*But if* more *wants* less, *or* less *wants* more,
*The Question is* Reverse *to that before.*

*Quest.* If 5 Men do a piece of Work in 11 days: In how long time shall 9 Men do the same piece of Work? *Answer*, 6 days, 2 hours, 40 minutes. See the Work as followeth.

Men

*Men,* *Days,* *Men.*
If 5 require 11 how long will 9 require?

5
———— D. H. M.
9) 55 (6 2 40
54
————
1 Day remain.
24 Hours in a Day.
————
9) 24 ( 2 H.
18
————
6 Hours remain.
6 0 Minutes in an Hour.
————
9) 360 (40 M.
36
————
00

*Quest.* How many Yards of Stuff, $\frac{1}{2}$ Ell wide, will ...e 12 Yds. of Broad Cloth, 7 Quarters wide?
qu broad, Yds. long, qu. broad.
If 7 12 $2\frac{1}{2}$
2 14 2
———— ———— ————
$14\frac{1}{2}$ qu. 48 $5\frac{1}{2}$ qu.
12
————
5) 168 (33 Yds. 2 q. $\frac{2}{5}$ long, for *Answ.*
15:
————
18
15
————
3 Yards remain.
4
————
5) 12 (2
10
————
2

 *Quest.*

*Queſt.* If when a Peck of Wheat coſt 2 *s.* 9 *d.* the Penny-loaf weighed 9 *oz.* 10 *dw.* How much will it weigh when the Peck is worth 1 *s.* 10 *d.*

```
   s. d.          oz. dw.           s.  d.
If 2  9 require  9  10 what will   1  10 requi
     12          20                12
    ---         ---               ---
    33 d.       190 s.            22 d.
                 33
                ---
                570
               570
           --------2|0
     22) 6270 (23|9
          44.  ------
         -------  oz.  dw.  gr.
          87.     11   19   13 2/22.
          66.
          ---
          210
          198
          ---             oz.  dw.  gr.
           12  Anſwer,    11   19   13 2/22
           24
          ---
           48
          24
         ---
    22) 288 ( 13 gr.
         22.
         ---
          68
          66
          ---
           2
```

The Golden Rule Reverſe is proved thus: Multiply the *firſt* Term by the *ſecond*, noti

e Product; also multiply the *third Term* by the urth; and if this Product be equal to the former, en is the Work done right, else not, as in *Que-ion* 1. of this *Chapter*,

If 8 Men do a piece of Work in 12 Days, in ow many Days shall 16 Men do it? The Answ: 6 Days.

Now the Product of 8 (the first Term) by 12 he second Term) is equal to the Product of 16 he third Term) by 6 (the fourth Term) and erefore I conclude the Work is right. See the peration.

| *Men,* | | *Days,* | | *Men.* | |
|---|---|---|---|---|---|
| If 8 | require | 12 | how many will | 16 | req. *Answ.* 6. |
| | | 8 | | 6 | |
| | | 96 | equal to | 96 | |

*More Questions to Exercise the Learner in the* Golden Rule Reverse.

*Quest.* 1. If 14 Gallons of Beer will serve 10 Men Days, how long will it serve 15 Men? *Answ.*

*Q.* 2. How much Shalloon, 3 quarters wide, is fficient to line a Coat which hath in it 3 Yards Cloth 6 quarters wide? *Answ.*

*Q.* 3. If the Governour of a Town, with 8000 en in it is besieged, and hath Provision of ictuals only for 4 months, the Query is, How any of his Men must he discharge that his Pro-isions may last the remaining Number of Men 8 onths? *Answ.*

*Q.* 4. How many Yards of 3 Foot wide, will ver a place that is 27 Foot long and 22 Foot oad? *Answ.*

*Q.* 5. If I lend a Friend 500 *l.* for 4 months nd having afterwards an occasion for the like indness) How much money ought he to lend

me again for 9 Months, to recompence the Co[urteſie] I ſhew'd him? *Anſwer,*

Q. 6. If 250 Men will dig a Trench (to co[ver] the Soldiers from the Enemy) in 16 Hours, [and] their is a neceſſity to have it done in 4 Ho[urs], How many Workmen muſt there be emp!oy'd [to] do it in that Time? *Anſwer,*

Q. 7. If 140 *lb.* Weight will be carried 100 m[iles] for 11 *s.* 8 *d.* How many miles will 1400 *lb.* wei[ght] be carried for the ſame Money? *Anſwer,*

Q. 8. If a Fortification was built by 240 Wo[rk]men in 10 Months, and being demoliſh'd it is [re]quir'd to have it rebuilt in 2 Months, How ma[ny] Men muſt there be appointed? *Anſwer,*

---

## CHAP. X.

### *Of the* Double Rule of Three, *or* Gold[en] Rule, *compoſed of Five Numbers.*

I. I Have been ſo large upon the foregoing R[ule] (which ſome call the Single Rule of Thr[ee]) that I may be the briefer in This.

II. This Rule has its Name from its having f[ive] *Numbers* given, to find a ſixth in proportion th[ere]unto, and is reſolv'd by two ſingle Rules of Thre[e]. But before you can work this Rule, you m[uſt] know how.

III. To diſpoſe the given Terms (or Numbe[rs]) in their due Order and Place, fit for Work. F[or] which this is

*The RULE.*

In all Queſtions in this Rule, there are fi[ve] Terms (or Numbers) given, namely, 3 Terms [of] Suppoſition, and 2 of Demand. Of the 3 Ter[ms] of Suppoſition, let *that* which has the ſame De[no]minatio[n]

[Combi]nation with the Term requir'd, be placed in the [se]cond Place, and place the other 2 Terms of Sup[po]sition one over the other in the first Place, and [th]en place the 2 Terms of Demand one over the [ot]her in the third Place; only observe to place [N]umbers of like Denomination in the same Rank, [viz.] two in the upper and two in the lower Rank, [as] in following Example.

*Qu.* 1. If the Carriage of 100 *lb.* 30 miles cost [1] *s.* what will the Carriage of 500 *lb.* cost, being [ca]rried 100 miles?

In this Question, 100 *lb.* 30 miles, and 1 *s.* are [th]e 3 Terms of Supposition, (because it is sup[po]sed to be so) and 500 *lb.* and 100 miles are the [T]erms of Demand; because it is demanded what [th]e Carriage of 500 *lb.* being carried 100 miles will [c]ost. Now because 1 *s.* is of the same Denomina[ti]on with the Term requir'd, for it is requir'd to [k]now how much, that is, how many Shillings the [C]arriage of 500 *lb.* 100 miles will cost; therefore [1] *s.* must be put into the second Place, and the o[th]er 2 Terms of Supposition must be set one over [th]e other in the first place, and the two Terms of [D]emand must be set one over another in the third [P]lace: So the Numbers being placed according to [th]e Rule, will stand thus;

| *lb.* | | *s.* | | *lb.* | |
|---|---|---|---|---|---|
| 100 | : | 1 | : : | 500 | : |
| M | | | | M | |
| 30 | : | | | 100 | : |

Having thus placed the given Terms (or Num[be]rs) in their due Order; then,

IV. To resolve any Question in the Double Rule [o]f Three, or Golden Rule, composed of 5 Num[be]rs. This is

*The* Rule.

Say, as the first Term in the upper Rank is to the second

second, so is the third *Term* in the same Rank a fourth. Again, As the first *Term* in the lo Rank is to the fourth last found, so is the o *Term* in the lower Rank to the *Term* required.

*Note*, Before you work these 2 single Rules, y must be sure to find (by the *Rule* in *Sect.* 14. of 8.) whether they are to be wrought by the *Di* or *Reverse* Rule, and accordingly work them.

Thus, considering the foregoing Question, find that both Parts of it are in the Direct Ru Therefore I say, If the Carriage of 100 *lb.* ( Miles) cost 1 *s.* What shall the Carriage of 500 (the same distance) cost? I multiply and divi (according to the Rule in the foregoing Chapt and find the Answer to be 5 *s.* Again, I say, the Carriage of 500 *lb.* 30 Miles cost 5 *s.* Wh shall the Carriage of the same Weight 100 Mi cost? I multiply and divide, (as before) and fi the Answer to be 16 *s.* 8 *d.* which is the Answ to the Question. See the Operation.

*lb.* *s.* *lb.*
100 : 1 :: 500 :
1
1|00) 5|00 (5 *s.*

*M.* *s.* *M.*
Again, 30 : 5 :: 100 :
5
*s.* *d.*
3|0) 50|0 (16 8
3
20
18
2 *s.*
12
3) 24 (8 *d.*

V. You may alſo work the *Double Rule of Three* one Operation, thus;

Obſerve to place the given *Terms*, as is before ught in the 3d *Section* of this *Chapter*.

Then, If the Queſtion be in the Double Rule *Three Direct* (that is, if both the ſingle Rules are the *Golden Rule Direct*;) Multiply the three laſt *ms* together for Dividend, and the two firſt for ivisor, the Quotient ſhall be the Anſwer, as in following Example.

*Queſt.* 2. If 14 Horſes eat 56 Buſhels of Oats in days, How many Buſhels will 20 Horſes eat in days? *Anſw.* 120 Buſhels. See the Operation.

| | *Horſes,* | *Buſhels,* | *Horſes.* | |
|---|---|---|---|---|
| | 14 : | 56 :: | 20 | |
| *Days* | 16 | | 24 | *Days.* |
| | 84 | | 80 | |
| | 14 | | 40 | |
| | 224 | | 480 | |
| | | | 56 | |
| | | | 2880 | |
| | | | 2400 | *Buſhels.* |

224) 26880 (120 Anſwer.
224..

448.
448.

0000

VI. But if your Queſtion be in the *Double Rule of Three Reverſe*, (that is, if one of the *Single Rules* be in the *Golden Rule Reverſe*) multiply the firſt, third, and fifth Numbers together for

Divi-

Dividend, and ſecond and fourth for Diviſo in the following Example.

*Queſt.* 3. If 48 Pioneers in 12 days, ca Trench 24 Yards long, How many Pioneers caſt a Trench 168 Yards long in 16 Days? A 252 Pioneers. See the Operation.

| | Days. | | Pion. | | Days. | |
|---|---|---|---|---|---|---|
| | 12 | : | 48 | :: | 16 : | |
| Yards | 24 | | | | 168 | Yards. |
| | 16 | | | | 48 | |
| | 144 | | | | 1344 | |
| | 24 | | | | 672 | |
| | 384 | | | | 8064 | |
| | | | | | 12 | |
| | | | | | 16128 | |
| | | | | | 8064 | Pioneers. |
| | | | | 384) | 96768 | (252 the Anſwer. |
| | | | | | 768 | |
| | | | | | 1996 | |
| | | | | | 1920 | |
| | | | | | 768 | |
| | | | | | 768 | |
| | | | | | 000 | |

VI. The Proof of the Double Rule of Three by proving each Single Rule, as is taught in t foregoing Chapter.

CHA

# CHAP. XI.

## Of *FELLOWSHIP.*

FEllowſhip is when divers Perſons trade toge-
ther with one common Stock; and when
y have gain'd or loſt, *this Rule* ſhews how to
each Man's Proportional Part of the Gains or
ſs

I. Fellowſhip is either *Single* or *Double*.

II. Single Fellowſhip is when the Stocks pro-
ſed are Single *Numbers*, without any Relation
Time, each Partner continuing his Money in
ck for the ſame time. This is reſolv'd by the
lden Rule, thus:

Say, As the whole Stock Is to the whole Gain
Loſs, So is each Man's particular Stock To his
icular Gain or Loſs: Therefore work by the
lden Rule ſo many times as there are Partners.

*Example.*

Three Merchants, *A*, B, and C, make a joynt Ad-
nture; *A* put into the common Stock 78 *l.* *B.*
t in 117 *l.* and C put in 234 *l* With this Stock
y trade till they have gain'd 2641 *l.* I demand
h Man's Share of the Gains? *Anſw.* *A* muſt
ve 48 *l.* B 72 *l.* and C 144 *l.* See the Operation.

| | *l.* | | | | | | |
|---|---|---|---|---|---|---|---|
| A, | 78 | Then, As | 429 : | 264 : | 78 : | 48 | *A.* |
| B, | 117 | | 429 : | 264 : | 117 : | 72 | *B.* |
| C, | 234 | | 429 : | 264 : | 234 : | 144 | *C.* |
| m | 429 | | | Whole Gain | | 264 | |

IV. Double Fellowſhip is when each Man's par-
ular Stock has a Relation to a particular Time,
this Caſe the Rule is

Multiply each Man's particular Stock into his
ime, noting the Products. Then ſay, (by the
Golden

Golden Rule) As the whole Sum of those [Pro]ducts is to the whole Gain or Loss, so is each M[an's] particular Product to his particular Gain or Lo[ss].

*Example.*

Two Merchants, *A* and *B*, enter Partner[ship]; *A* put in 40 *l.* for 3 Months; and *B* put in 7[5 *l.*] for 4 Months, and they gain'd 70 *l.* I dem[and] each Man's Share of the Gains, proportionabl[e to] his Stock and Time? Answer, *A.* must have 2[0 *l.*] and *B.* 50 *l.* See the Operation.

| | | | |
|---|---|---|---|
| 40 Pound. | | 75 Pound. | |
| 3 Months. | | 4 Months. | |
| *A*, 120 Product. | | *B*, 300 Product. | |
| | | 120 | |
| Sum of the Products, | | 420 | |

Then, As $\begin{cases} 420 : 70 :: 120 : 20 : A. \\ 420 : 70 :: 300 : 50 : B. \end{cases}$

Proof, 70

## CHAP. XII.

## *NUMERATION of VULGA[R] FRACTIONS.*

I. A Fraction is part of a Unit [or One.]

II. A Fraction is exprest by 2 Numbe[rs], one set over a Line, and the other under the Li[ne], thus, $\frac{1}{2}$.

III. A Fraction consists of two Parts, that abo[ve] the Line, call'd the *Numerator*, and that under t[he] Line, call'd the *Denominator*.

IV. The *Denominator*, expresses the Number [of] equ[al]

ual Parts that a Unit [or one] is supposed to be vided into ; and the Numerator shews how ma- of those Parts are signified by the Fractor.

*Example.*

This Fraction $\frac{5}{11}$ is to be read five Elevenths ; hat is, 5 Parts of 11) Here the Unit is supposed be divided into eleven equal Parts, and this action signifies five of them ; so that $\frac{5}{11}$ is al- ost one half: In the same manner understand all her Fractions.

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## CHAP. XIII.

## *EDUCTION of VULGAR FRACTIONS.*

TO Reduce a Mixt Number to an Improper Fraction.

The Rule is, Multiply the Integral Part, (or Whole Number) by the Denominator of the ractional Part ; and to the Product add the Nu- erator, and that Sum place over the Denomina- or for a new Numerator ; so this new Fraction all be equal to the mixt Numbers given.

*Example.*

1. Reduce $16\frac{3}{7}$ to an Improper Fraction.

Here I multiply the whole Number 16 by 7 the Denominator, and to the roduct add the Numera- or 3, and the Sum is 15, which I put over the Denominator 7, and it makes $\frac{115}{7}$. See the Work in the Margin.

| | |
|---|---|
| *Whole Numb.* | $16\frac{5}{7}$ |
| *Denominator* | 7 |
| | 115 |
| *Answer,* | $\frac{115}{7}$. |

2. What

2. What is the Improper Fraction of $88\frac{16}{74}$?

Answ. $\frac{2128}{4}$

II. To reduce a whole Number to an Impro Fraction. The Rule is,

Multiply the given Number by the intend Denominator, and set the Product for a Numa tor over it.

*Example.*

1. Reduce 17 into a Fraction whose Deno nator shall be 14.

To do which I multiply 17 by the intend Denominator 14, and the Product is 238, whi I put over 14, as a Numerator, and it makes equal to 17. See the Work.

$$\begin{array}{r} 17 \\ 14 \\ \hline 68 \\ 17 \\ \hline 238 \end{array}$$

14 intended Denom.

*Facit* $\frac{238}{14}$ equal to 17. Otherwise let t given Number be the Numerator an Denominator. Thus 17 is $\frac{17}{1}$.

2. Reduce 472 into an Improper Fraction wh Denominator shall be 32.

*Facit* $\frac{15104}{32}$ or $\frac{472}{1}$.

III. To Reduce an Improper Fraction to its quivalent Whole or Mixt Number.

The Rule is, Divide the *Numerator* by the *D nominator*, and the *Quotient* is the *Whole Num* equal to the *Fraction*; and if any thing remai put it for a *Numerator* over the *Divisor*, so y have the *Mixt Number* equal to the *Fraction*.

*Example.*

Reduce $\frac{748}{7}$ into its equivalent mixt Number.

[d]ivide 748, the Nu[mera]tor, by 7, the De[nom]inator, and the Quo[tient] is 106, and there [rema]ins 4, which I place [over] the Divisor 7 for a [Nu]merator, by the side [of t]he whole Number, [and] it makes $106\frac{6}{7}$, which [is eq]ual to $\frac{748}{7}$, the Im[prop]er Fraction given, as [in th]e Margin.

7) 748 ($106\frac{6}{7}$
7

48
42 Answ. $106\frac{6}{7}$

6 Equivalent to $\frac{748}{7}$.

Find a mixt Number equal to the improper [Frac]tion $\frac{6742}{464}$. *Answ.* $14\frac{246}{464}$.

[I]V. To reduce a Fraction to his lowest Terms, [equa]l to the Fraction given.

*The RULE.*

[If] the Numbers of the Numerator and Denomi[nato]r are even, take half of one, and half of the o[ther] as often as you can; and when you can do [n]o longer (by reason of one of them falls out to [a]n odd Number) then divide them either by [3, 4,] 5, 6, 7, 8, or 9, which you find will divide [the]m both without any Remainder; and when you [hav]e thus reduced them as low as you can, the gi[ven] Fraction is then brought to his lowest Terms, [and] is of the same Value that he was before.

*Example.*

1. Reduce $\frac{72}{144}$ into its lowest Term.

| 72 | 36 | 18 | 9 | 3 | 1 |
|---|---|---|---|---|---|
| 144 | 72 | 36 | 18 | 6 | 2 |

[H]ere because both the Numerator and Denomi[nat]or end in even Numbers, I find they may be [red]uc'd by 2, or 4, or 6, &c. Therefore (after draw-

drawing a long Line from it,) I first take the of the *Numerator*, saying, the half of 72 is for a new *Numerator*; also the half of 144 is for a new *Denominator*. Again, the half of 18, for a new *Numerator*; also the half of 36, for a new *Denominator*. Once more, the of 18 is 9, for a new *Numerator*, and the hal 36 is 18, of a new *Denominator*; so that now brought to $\frac{9}{18}$; and now I can go no lowe halving it, because 9 is an uneven Num wherefore I must try to divide them by 3, 4 6, 7, 8 or 9, and I find 3 or 9 will divide t both, which will bring them to $\frac{1}{2}$ equal to $\frac{7}{144}$

*More Examples follow.*

2. Reduce $\frac{642}{896}$ into its lowest Term. *Ans*
3. What is $\frac{274}{688}$ in its lowest Term. *Ans*
4. Find the lowest Term of $\frac{6824}{8474}$. *Answ.*

Tho' a Fraction cannot be brought into lo Terms for Operation, than by this 4th Rule, to help the Conception it may be thus.

Divide the *Denominator* by the greatest N *ber* you can find will divide it exactly, witho *Remainder* (tho' it will not divide the *Numer* so) and put the *Quotient* for a new *Denomina* and by the same *Number* divide the *Numer* putting the *Quotient*, with the *Remainder*, o the *Divisor*, for a *Numerator*. so the *Numer* will be a mixt *Number*: So $\frac{23}{24}$ (which is alre in its lowest Terms) will be reduced to $\frac{5\frac{3}{4}}{6}$, is, 5 parts of 6, and $\frac{3}{4}$ of a part.

See the Work in the Margin.

Here I divide the *Denominator* 24 by 4, and the *Numerator* 23 by 4, and the *Quotients* I set one over another, with the *Remainder* over the *Divisor*.

```
4) 24 (6
   24
   --
    0

4) 23 (5
   20
   --
    3
```

ow to reduce this Compound Fraction Simple one of the same Value, work , multiply the Integral part of the Numerator by the Denominator of the Fractional part, and to the Product add the Numerator of the Fractional part for a new Numerator; then multiply the Denominator of the Fraction by the Denominator of the Fractional Part the Numerator for a new Denominator.

$$\frac{5\frac{3}{4}}{6}$$

Thus I multiply 5, the Integral Part the *Numerator*, by 4, the *Denominator* of the Fractional part, which makes and add to it 3, the *Numerator* of the Fractional part, and it makes 23, 23 for a *Numerator*. Then I multiply 6, *Denominator* of the Fraction, by 4, *Denominator* of the Fractional Part, it makes 24 for a new *Denominator*.

$$\begin{array}{r} 5\frac{3}{4} \\ 4 \\ \hline 23 \end{array} \qquad \begin{array}{r} 6 \\ 4 \\ \hline 24 \end{array}$$

us $\frac{5\frac{3}{4}}{6}$ is reduced to $\frac{23}{24}$.

There is yet another way to reduce a Fraction its lowest Terms, that is, by finding the great- *Number* that will divide both the *Numerator* and *Denominator*, and leave no *Remainder* (call'd a mmon Measure.) To find which *Number*

*This is the RULE.*

Divide the *Denominator* of the given Fraction by *Numerator*, and if any thing remain, divide *Divisor* by it; and should there any thing yet main, divide your last *Divisor* by it, and so conti- dividing the last *Divisors* by the *Remainders*, til there be no *Remainder*, (not minding the *Quotient*) so is the last *Divisor* the greatest common easure unto the *Number* or *Fraction* given.

*Example.*

Reduce $\frac{91}{117}$ into its lowest Terms by a common Measure.

Here

Here I divide the Denominator 117 by the Numerator 91, and the Remainder is 26, by which I divide 91, and there remains 13, by which I divide 26, and nothing remains; wherefore the last Divisor 13 is the greatest common Measure unto the given Fraction $\frac{91}{117}$ (as you may see by the Work in the Margin) by which N ber (13) I divide the Numerator 91, and Quotient is 7, for a new Numerator: T divide the Denominator 117 by 13, and it q 9 for a new Denominator. Thus have I f (by a common Measure) $\frac{7}{9}$, which is equal to

```
91) 117 (1
    91
    ———
    26) 91 (3
        78
        ———
        13) 26
            26
            ——
             0
```

*Note*, When the Numerator and Denomin have Cyphers at the End of each of them, may cut off equal Cyphers in both, and sh the Work. Thus $\frac{500}{800}$ by taking away or cu off the Cyphers is speedily reduced to $\frac{5}{8}$, whi the same in Value with $\frac{500}{800}$. Also $\frac{7000}{9000}$ is re to $\frac{7}{9}$, and $\frac{400}{8000}$ to $\frac{4}{80}$.

V. To find the Value of a Fraction in the kn Parts of Money, Weights and Measure.

*The Rule.*

Multiply the Numerator by the Parts of the lesser Denomination that are equal in Value Unit of the same Denomination with the Fr on; and divide the Product by the Denomin and the Quotient gives you its Value in the Parts you multiply by; and if any thing rem multiply it by the Parts of the next lesser D mina

ation, and divide as before; so proceed till can bring it no lower, and the several Quotits will give you the Value of the Fraction as required; and if any thing at last remain, e it a Numerator to the former Denominator.

*Example.*

. What is the Value of $\frac{38}{44}$ of a Pound Sterl.?
w. 17 *s.* 03 *d.* 1 *q.* $\frac{4}{44}$. See the Operation.

```
Multiply   38 the Numerator
      by   20 the Shillings in a Pound.
         ----
ide by  } 44 ) 760 (17 s.
Denom.  }      44:
              ----
               320
               308
              ----
Remain          12 multiply'd.
    by          12 the Pence in a Shilling.
              ----
                24
                12
              ----
          44) 144 (3 d.
              132
              ----
Remain         12 multiply'd
    by          4 the Farthings in a Penny.
              ----
           44) 48 (1 q 4/44.
               44
              ----
Remain          4
```

*Example*

*Example* 2.

What is the Value of $\frac{4}{12}$ of a Pound Troy?

*Answ.* 2 *oz.* 13 *dw.* 8 *gr.* equal to $\frac{4}{12}$ of a lb.

Multiply 4 the *Numerator*,
by 12 the Ouncs ein a Pound,

Divide by the *Denominator.* 18)48 (2 *oz.*
36

Remain 12 multiply'd
by 20 the *dw.* in an Ounce.

18) 240 ( 13 *dw.*
18:
60
54

Remain 6 multiply'd
by 24 the Grains in a *dw.*

18) 144 (8 *gr.*
144
0

*Example* 3.

What is the Value of $\frac{7}{8}$ of a Yard?

*Numerator* 7 multiply'd
by 4 quarters of a Yard.

Divided by the *Denominator.* 8)28 ( 3 quarters.
24

4 quarters remain, multiply'd
by 4 Nails in a quarter.

8 ) 16 ( 2 Nails.
16
0

*Answ.* 3 qu. 2 nails, equal to $\frac{7}{8}$ of a Yard.

VI. T

VI. To reduce a compound Fraction to a Sim- one of the same Value.

*The* Rule.

Multiply all the Numerators, one in another, r a New Numerator, and multiply all the De- minators, one in another, for a New Deno- inator.

*Example.*

1. Reduce $\frac{4}{5}$ of $\frac{7}{8}$ of $\frac{8}{9}$ into a Simple Fraction.

| umer. | Denom. |
|---|---|
| 4 | 5 |
| 7 | 8 |
| — | — |
| 8 | 40 |
| | 9 |
| — | —— |
| | 360 |

I multiply 4, 7, and 8, one in another, and they make 224 for a New Numerator; also I multiply 5, 8, and 9, one in another, and the Product is 360 for a New Denominator; so the Simple Fraction is $\frac{224}{360}$, which is equivalent to $\frac{4}{5}$ of $\frac{7}{8}$ of $\frac{8}{9}$.

*Facit* $\frac{224}{360}$

2. Reduce $\frac{3}{4}$ of $\frac{4}{5}$ of $\frac{8}{10}$ to a Simple Fraction. *nsw.* $\frac{96}{200}$.

3. What is the Simple Fraction of $\frac{12}{13}$ of $\frac{10}{18}$ of ? *Answ.* $\frac{6144}{11232}$.

Hence, to find the Value of a Compound Fra- ion, first reduce it to a Simple one, and then nd its Value by Rule 5.

VII. To reduce Fractions of unequal Denomi- tions to Fractions (of the same Value) having e- ual Denominations, which some call *Cogno- ina's*.

*The* Rule.

Multiply each Numerator by all the Denomi- ators except his own, for New Numerators; en multiply all the Denominators, one in a- other, for a common Denominator to all the Numerators.

G *Example.*

*Example.*

Reduce $\frac{4}{5}$, $\frac{5}{8}$ and $\frac{7}{8}$ to a common Denominat[or]. See the Work as followeth.

| | | | all the Denom. |
|---|---|---|---|
| 4 | 5 | 7 | |
| 6 | 5 | 6 | 5 |
| | | | 6 |
| 24 | 25 | 42 | |
| 8 | 8 | 5 | 30 |
| | | | 8 |
| 192 | 200 | 210 | |
| | | | 240 |

$\left.\begin{matrix} \frac{192}{240} \\ \frac{200}{240} \\ \frac{210}{240} \end{matrix}\right\}$ equal to $\left\{\begin{matrix} \frac{4}{5} \\ \frac{5}{8} \\ \frac{7}{8} \end{matrix}\right.$ The three Fractions given

VIII. To reduce a Fraction from one Denomination to another.

This is either Afcending or Defcending; Afcending, when a Fraction of a *fmaller* is brought to a *greater* Denomination:

And, Defcending, when a Fraction of a greater Denomination is brought lower.

1. To reduce a Fraction of a *fmaller* to a greater Denomination, make of it a Compound Fraction by comparing it with all the intermediate Parts between it, and that you would reduce it to; then (by Rule 6) reduce it to a Simple Fraction.

*Example.*

Reduce $\frac{4}{5}$ of a Penny to the Fraction of a Pound Sterling.

$\frac{4}{5}$ of $\frac{1}{12}$ of $\frac{1}{20}$

| |
|---|
| 12 |
| 5 |
| 60 |
| 20 |
| 1200 |

$\frac{4}{1200}$ of a Pound, for Anfwer.

2. Reduce

2. Reduce $\frac{1}{7}$ of an Ounce, *Averdupois* Weight, into the Fraction of a hundred Weight.

$\frac{1}{7}$ of $\frac{1}{16}$ of $\frac{1}{28}$ of $\frac{1}{4}$

$$\begin{array}{r} 16 \\ 7 \\ \hline 112 \\ 28 \\ \hline 896 \\ 224 \\ \hline 3136 \\ 4 \\ \hline 12544 \end{array}$$

Answer, $\frac{1}{12544}$ of a hundred

2. To reduce a Fraction of a greater to a Fraction of a lesser Denomination.

*Rule,*

Reduce the Numerator of the Fraction into that Denomination you would have your Fraction of, and place it over the Denominator of the given Fraction.

*Example.*

Reduce $\frac{4}{1200}$ of a Pound to the Fraction of a Penny.

$$\begin{array}{r} 4 \\ 20 \\ \hline 80 \\ 12 \\ \hline 960 \end{array}$$

$\frac{960}{1200}$ Answer, which Fraction being reduced to its lowest Terms (by Rule 4) is equal to $\frac{4}{5}$.

2. Reduce $\frac{1}{12544}$ of a hundred to the Fraction of an Ounce.

C
1
4
―
4
28
―
112
16
―
672
112
―
1792

$\frac{1792}{12544}$ Answer, which in its lowest Terms is $\frac{1}{7}$.

IX. To Reduce a Fraction from one Denomination to another. The Rule is, As the given Denominator is to his Numerator, so is the intended Denominator to his Numerator: Thus $\frac{3}{4}$ will be found to be $\frac{15}{20}$, or 15 parts of 20.

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## CHAP. XIV.

### *ADDITION of VULGAR FRACTIONS.*

I. RULE. If the Fractions to be added are *Cognomina's*, [that is, if they have a common Denomination,] add their Numerators together, for a New Numerator to the common Denominator: This new Fraction shall be equal to the Sum of the given Fraction. If this Sum be an Improper Fraction, reduce it to a whole or mixt Number, by Rule 3 of the last Chapter.

*Example.*

*Example.*

To $\frac{4}{12}$ add $\frac{7}{12}$, $\frac{9}{12}$ and $\frac{11}{12}$

Numerators.

$$\text{dd}\left\{\begin{array}{r}4\\7\\9\\11\\\hline 31\end{array}\right.$$

Answer, $\frac{31}{12}$, the Sum of the given Fraction, which being an Improper Fraction, will be reduced to the mixt Number $2\frac{7}{12}$.

Rule II. If the Fractions have unequal Deno-inators, reduce them to *Cognomina*'s (by Rule of the last Chap.) and then proceed as before.

*Example.*

What is the Sum of $\frac{3}{4}$, $\frac{7}{5}$ and $\frac{5}{6}$?

The Fractions in a common Denominator are $\frac{90}{20}$, $\frac{96}{20}$ and $\frac{100}{120}$. Their Numerators added to-ether, make 286 for a new Numerator to the ommon Denominator 120. Thus $\frac{286}{120}$ equal to e mixt Number $2\frac{46}{120}$ or $2\frac{23}{60}$.

III. If mixt Numbers are to be added toge-er, The Rule is,

Work with the Fractional Parts, as before, then dd the Sum of the Fractions to the Sum of the ntegers, and it is done.

*Example.*

What is the Sum of $6\frac{1}{2}$ and $34\frac{3}{5}$?

The Sum of the Fraction by the last Exam-le is $1\frac{1}{10}$, which being added to 6 and 34 akes $41\frac{1}{10}$.

$$\begin{array}{r}1\frac{1}{10}\\6\\34\\\hline\end{array}$$

nswer, $41\frac{1}{10}$, the Sum required.

IV. When any of the Fractions to be added are ompound Fractions, reduce the Compound Fra-ion to a Simple one (by Rule 6. of the last

 Chap.)

Chap.) then find the Sum by the first Rule of th[is] Chapter.

*Example.*

To $\frac{14}{27}$ add $\frac{3}{4}$ of $\frac{4}{5}$.

The Compound Fraction $\frac{3}{4}$ of $\frac{4}{5}$, reduced to [a] Simple one, are $\frac{12}{20}$ or $\frac{3}{5}$.

The Common Denominator of $\frac{3}{5}$ and $\frac{14}{27}$ is $\frac{81}{135}$ and $\frac{70}{135}$ the Sum of the Numerators, is 151, and the Sum of the given Fractions is $\frac{151}{135}$.

V. When the Fractions to be added are not [of] one Denomination, they must be reduc'd to one and the same Name (by Rule 8 of the last Chap.) and then proceed as before.

*Example.*

To $\frac{4}{5}$ *lb.* add $\frac{7}{8}$ *s.*

Here one of the Fractions is of a Pound, and the other of a Shilling; and before I can add them I must reduce $\frac{7}{8}$ *s.* to the same Name as the other is, namely, the Fraction of a Pound (by Rule [8] of the last Chap) and it makes $\frac{7}{160}$ *lb.* then $\frac{4}{5}$ [lb.] and $\frac{7}{160}$ *lb.* will be found to be $\frac{640}{400}$, or $\frac{64}{80}$ (by the Rule 7) or $\frac{4}{5}$ (by Rule 4)

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# CHAP. XV.

## *SUBTRACTION of VULGAR FRACTIONS.*

I. TO subtract one Fraction from another.

The Rule is.

As in Addition, so here, before Subtraction can be perform'd, the given Fractions must be reduced (if they require it) to the same Denomination and Denomniator: Then subtract one Numerator from the other, and the Remainder shall be a new Numerator

ator to the Common Denominator, which new
ction shall be the Excess or Difference between
given Fraction.

*Example* 1.

Subtract $\frac{4}{5}$ from $\frac{7}{8}$.
The 2 Fractions being reduced to $\frac{32}{40}$ and $\frac{35}{40}$, I
btract the Numerators 32 from 35, and there re-
ins 3, which I set over the Common Denomi-
tor 40 for a Remainder: Thus $\frac{3}{40}$ the Diffenence
tween $\frac{4}{5}$ and $\frac{7}{8}$.

*Example* 2.

Subtract $\frac{2}{4}$ and $\frac{4}{6}$ from $\frac{7}{8}$ and $\frac{9}{10}$.
Because the Denominations are different, I re-
ce them into one Denomination, and they make
$\frac{00}{20}$, $\frac{1280}{1920}$, $\frac{1680}{1920}$, $\frac{1728}{1920}$. Then I add the Nume-
tors of the two first together, and they make
$\frac{40}{20}$, also I add the Numerators of the two last
d they make $\frac{3408}{1920}$: Then I subtract the Nume-
tor 2240 from the Numerator 3408, and there
mains 1168, which I set over the common De-
ominator thus, $\frac{1168}{1920}$, the Remainder or Diffe-
nce of $\frac{2}{4}$ and $\frac{4}{6}$ from $\frac{7}{8}$ and $\frac{9}{10}$.

II. To subtract a Fraction from a whole Num-
er,

## The Rule is,

Subtract the Numerator from the Denominator,
nd place the Remainder over the Denominator:
Then subtract one from the whole Number, and
lace the Remainder before the Fraction before
ound, which mixt Number is the Remainder or
Difference.

*Example* 1.

Subtract $\frac{8}{12}$ from 18.
Here I say, 8 (the Numerator from 12) the
Denominator, there remains 4, which I place o-
ver 12 thus $\frac{4}{12}$: Then 1 from 18 (the whole
Number) rests 17, which with $\frac{4}{12}$ makes $17\frac{4}{12}$
for Answer.

*Example* 2.

From 34 take $\frac{14}{27}$, remains 33 $\frac{13}{27}$.

III. To ſubtract a Fraction from a mixt N ber, or one mixt Number from another.

The Rule is,

Firſt, Reduce the Fractions to *Cognomina*'s, a common Denominator: ) Then if the Fra to be ſubtracted be leſſer than the other, ſubt the leſſer Numerator from the greater, and p the Remainder over the common Denominat Alſo ſubtract the leſſer Integral Part from greater, and the Remainder joyn'd with the maining Fraction, is the Anſwer requir'd.

*Example* 3.

From 14 $\frac{4}{5}$ take 12 $\frac{2}{3}$.

The Fractions being reduced are $\frac{10}{15}$ and $\frac{12}{15}$ ſubtract 10 (the leſſer Numerator) from 12 (t greater) and the Remainder is 2, which I put ov 15, the common Denominator, thus, $\frac{2}{15}$: Th 12 (the leſſer Integral Part) from 14 (the gre ter) reſt 2, which joyn'd with the remaini Fraction $\frac{2}{15}$ makes $\frac{2}{15}$ for the Anſwer.

But if it ſhould happen (as ſometimes it doe that the Fraction to be ſubtracted is greater th the Fraction from whence 'tis to be ſubtracted Then

The Rule is,

Subtract the Numerator of the greater Fra on from the common Denominator, and add th Remainder to the Numerator of the leſſer Fr ction, and place their Sum as a new Numerato over the common Denominator, which Fractio mind: Then (for one borrow'd) add one to th leſſer Integral Part, and ſubtract it from th greater, and to the Remainder annex the Fra ction before minded; ſo this new mixt Num ber ſhall be the Anſwer.

*Exam-*

*Example.*

Subtract 15 $\frac{4}{5}$ from 24 $\frac{5}{8}$.

Which Fractions reduced, are $\frac{32}{40}$ and $\frac{25}{40}$. Now ke 32 out of 25 I cannot, therefore I subtract from 40, (the common Denominator) rests 8, ich I add to 25 (the lesser Numerator) and makes 33 for a new Numerator to 40 (the mmon Denominator) thus, $\frac{33}{40}$; then 1 bor-w'd, and 15 (the lesser Integral Part) is 16, t of 24, (the greater) rest 8, to which annex , and it makes 8 $\frac{33}{40}$, the remaining difference quir'd between 15 $\frac{4}{5}$ and 24 $\frac{5}{8}$.

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# CHAP. XVI.

## *ULTIPLICATION of VULGAR FRACTIONS.*

IF the Fractions to be multiply'd are both Simple, or both Compound, or one Simple d the other Compound,

The Rule is,

Multiply the Numerators continually for a w Numerator, and multiply the Denominators ntinually for a new Denominator; which new action is the Product sought.

Three Examples follow to the 3 Cases.

1. Example of both Simple.

What is the Product of $\frac{6}{8}$ by $\frac{5}{7}$?

| | Numer. | | Denom. | |
|---|---|---|---|---|
| | 6 | | 8 | |
| ultiply'd | 5 | Multiply'd | 7 | Answer, $\frac{30}{56}$ |
| | 30 | | 56 | |

2. Example of both Compound.

Multiply $\frac{4}{5}$ of $\frac{6}{7}$ by $\frac{7}{8}$ of $\frac{11}{12}$.

| All the Numerators multiply'd continually | | All the Denominators multiply'd continually | | |
|---|---|---|---|---|
| | 4 | | 5 | |
| | 6 | | 7 | |
| | 24 | | 35 | |
| | 7 | | 8 | Answ. $\frac{1842}{3360}$, |
| | 168 | | 280 | |
| | 11 | | 12 | |
| | 168 | | 3360 | |
| | 168 | | | |
| | 1448 | | | |

3 Example of one Simple and the other Compound
What is the Product of $\frac{12}{14}$ by $\frac{2}{3}$ of $\frac{6}{8}$ of $\frac{9}{10}$?

| All the Numerators multiply'd. | | All the Denominators multiply'd. | | |
|---|---|---|---|---|
| | 12 | | 14 | |
| | 2 | | 3 | |
| | 24 | | 42 | |
| | 6 | | 8 | Answ. $\frac{1296}{3360}$ |
| | 144 | | 336 | |
| | 9 | | 10 | |
| | 1296 | | 3360 | |

Note, In Multiplication of Fractions, the Product (contrary to Multiplication of whole Numbers) is always less than either of the Terms given: The reason is, because a Fraction being less than one, if I multiply any Fraction by another it followeth that I take the Fraction less than once and therefore the Product must needs be less than the first Fraction; yet the third Number or Product beareth the same proportion to each of the two first Fractions that the other of those two Fractions doth bear to a Unit.

II. If a Fraction to be multiply'd by a whole or mixt Number, or a mixt Number by a mixt Number,

Th

The Rule is,

Reduce the whole, or mixt Number, to an Improper Fraction, (as taught in Reduction, Rule 1.) and then proceed as before.

1. Example by a Whole Number.

What is the Product of 32 by $\frac{4}{5}$?

I put a Unit for a Denominator under the Whole Number 32, to make it an Improper Fraction, thus, $\frac{32}{1}$; then $\frac{32}{1}$ by $\frac{4}{5}$ makes $\frac{128}{5}$ for Answer.

2. Example by Mixt Numbers.

What is the Product of 37 $\frac{4}{6}$ by 15 $\frac{7}{8}$?

The mixt Numbers, when reduced to Improper Fractions, are $\frac{226}{6}$ and $\frac{127}{8}$, which multiply'd by Rule 1 of this Chapter, produceth $\frac{28702}{48}$.

In this place of multiplying a mixt Number by a mixt, it may not be unacceptable to the Learner to shew how to solve those pretended nice Questions which many are wont to value themselves for, propounding to, and puzzling others with: It is to multiply Shillings and Pence by Shillings, and Pence, and they are commonly proposed after this manner.

*Quest.* What is the Product of 4 *s.* 6 *d.* by 2 *s.* 6 *s*?

Now many who are unacquainted with Fractions are apt to do it thus.

| *s.* | *d.* | | *s.* | *d.* |
|---|---|---|---|---|
| 4 | 6 | by | 2 | 6 |
| 12 | | | 12 | 6 |
| 54 *d.* | | | 30 *d.* | |

| | *d.* | | *s.* | *d.* |
|---|---|---|---|---|
| | 54 | the Pence in | 4 | 6 |
| Multiply'd by | 30 | the Pence in | 2 | 6 |
| 12) | 1620 | | | |
| 2\|0) | 13\|5 | | | |
| *lb.* | 6 | 15 *s.* | | |

And

And ſo they make 6 *lb.* 15 *s.* for Anſw which is juſt 12 times the true Anſwer, as y may ſee by the following true way of working by Fractions.

Thus,

4 *s.* 6 *d.* by 2 *s.* 6 *d.* that is 4 $\frac{6}{12}$ by 2 $\frac{6}{12}$, whi being reduced by the Rules already laid dow to an improper Fraction, makes $\frac{1620}{144}$; the val whereof being found, makes 11 *s.* 3 *d.* for t true Anſwer, as you may ſee by the whole Wo following,

$$
\begin{array}{lcc}
 & 4\ \frac{6}{12} & \text{by} \quad 2\ \frac{6}{12} \\
 & 12 & 12 \\
\hline
 & 54 & 30 \\
 & 54 & \\
 & 30 & \\
\hline
\text{New} & 1620 & \\
 & 12 & \\
 & 12 & \\
\hline
\text{New} & 144\ \text{Denom.} &
\end{array}
$$

Makes $\frac{1620}{144}$ which is valued thus.

$$
\begin{array}{rl}
144) & 1620\ (11\ s. \\
 & 144 \\
\hline
 & 180 \\
 & 144 \\
\hline
 & 36\ \text{remains} \\
 & 12 \\
\hline
144) & 432\ (3\ d. \\
 & 432 \\
\hline
 & (0)
\end{array}
$$

*Anſwer*, 11. *s*. 3 *d*. the true Product of 4 *s*. 6 *d*. by 2 *s*. 6 *d*.

Another way of anſwering Queſtions of this Nature may be done by croſs Multiplication.

Thus,

| | *s*. | *d*. |
|---|---|---|
| | 4 | 6 |
| Multiply'd by | 2 | 6 |
| | 8 | 0 |
| | 1 | 0 |
| | 2 | 0 |
| | 0 | 3 |
| Makes | 11 | 3 for Anſwer. |

Here the Shillings are multiply'd by the Shillings, gives 8 *s*; then (croſs-ways) the 2 *s*. in the Multiplier by the 6 *d*. in the Multiplicand, gives 12 *d*. or 1 *s*. and the 4 *s*. in the Multiplicand being multiply'd by 6 *d*. in the Multiplier, gives 24 *d*. or 2 *s*. Laſtly, the Pence of both being multiply'd one into another, makes 36 Parts, (12 of which being counted a Penny) is 3 *d*. The Total whereof is the true Product of 4 *s*. 6 *d*. by 2 *s*. 6 *d*. and ſo in like manner is any other Number of Shillings and Pence, multiply'd by Shillings and Pence.

## CHAP. XVII.

## *DIVISION of VULGAR FRACTIONS.*

TO divide one Single Fraction by another.

The

The Rule is,

Multiply the Numerator of the Dividend by Denominator of the Divisor, and the Product for a New Numerator of the Quotient; Then multiply the Denominator of the Dividend by the Numerator of the Divisor, and the Product put the Denominator of the Quotient: and this n Fraction is the Quotient of the said Division.

*Example.*

What is the Quotient of $\frac{4}{8}$ divided by $\frac{3}{4}$?

Here I Multiply 4 (the Numerator of the Dividend) by 4 which is the Denominator of the Divisor, and the Product is 16, which I p for a new Numerator of the Quotient; then I multiply 8, (being the Denominator of the Dividen by 3, the Numerator of the Divisor, and the Product is 24, the Denominator of the Quotient, th $\frac{16}{24}$ for Answer, as by the Work in the Margin.

Divisor, Dividend.
$\frac{3}{4}$) $\frac{4}{8}$ ($\frac{16}{24}$ Quot.

II. If the Dividend, or Divisor, be one or bo of them Compound Fractions,

The Rule is,

Reduce the Compound Fractions to simp ones, and then proceed as before.

*Example.*

What is the Quotient of $\frac{7}{12}$, divided by $\frac{2}{4}$ of $\frac{3}{5}$?

The Compound Fraction $\frac{2}{4}$ of $\frac{3}{5}$ being reduc to a Simple Fraction, is $\frac{6}{20}$, by which divide $\frac{7}{12}$ the Quotient is $\frac{140}{72}$,

Or without Reduction thus.

Multiply the Numerator or Numerators of t Dividend, by the Denominator or Denominato of the Divisor, for a new Numerator; also, mu tiply the Denominator or Denominators of the D viden

end, by the Numerator or Numerators of the Divisor, for a new Denominator: This new Fraction is the Quotient.

*Example.*

Divide $\frac{3}{4}$ of $\frac{2}{3}$ by $\frac{1}{4}$ of $\frac{1}{8}$.

$$\begin{array}{rr} 3 & 4 \\ 2 & 3 \\ \hline 6 & 12 \\ 4 & 1 \\ \hline 24 & 12 \\ 8 & \\ \hline 192 & \end{array}$$

Answer, $\frac{192}{12}$.

III. If the Dividend and Divisor are both mixt Numbers,

The Rule is,

Reduce the mixt Numbers to an improper Fraction, and proceed as before.

*Example.*

What is the Quotient of 14 $\frac{4}{5}$ divided by $\frac{6}{7}$?

The mixt Numbers being reduced to improper Fractions are $\frac{74}{5}$ and $\frac{132}{7}$; the Quotient of divided by $\frac{132}{7}$, is $\frac{518}{660}$ for Answer.

IV. To divide a whole Number by a Fraction.

The Rule.

Make the whole Number an improper Fraction, by putting a Unit for a Denominator to it; then multiply the said whole Number by the Denominator of the given Fraction, and place the product for a new Numerator; and for a Denominator set under it the Numerator of the Fraction. Example, Divide 22 by $\frac{4}{5}$. See the Work in the Margin.

$\frac{4}{5}$ . $\frac{22}{1}$ ( $\frac{115}{4}$.

V. But

V. But to divide the Fraction by the wh Number,

The Rule is,

Multiply the Denominator of the Fraction the whole Number, and set the Total for the Denominator, not changing the Numerator, as *per* Margin. $2\frac{2}{1})\frac{4}{5}($

## CHAP. XVIII.

### *The* RULE *of* THREE DIREC *in* VULGAR FRACTION

I. PRepare the Work thus, (1.) Let the f and third Terms be of the same Denon tion; if they are not, reduce them to be (2.) Let the Compound Fractions be reduced Simple ones. (3.) Let mixt or whole Numb be reduced to improper Fractions, the last putting 1 for the Denominator. Then,

II. Multiply the Numerator of the first Te by the Denominator of the second; and t Product by the Denominator of the third Te for a new Denominator: Then multiply t Denominator of the first Term by the Nu rator of the second, and that Product by t Numerator of the third for a new Numerat This new Fraction is the fourth Term, or A swer to the Question.

*Example* 1.

If $\frac{2}{4}$ of a Yard of Cloth cost $\frac{3}{8}$ of a Poun what will $\frac{5}{7}$ cost?

First, I place the three Terms, as taught whole Numbers, thus.

If $\frac{2}{4}$ cost $\frac{3}{8}$, what cost $\frac{5}{7}$?

Th

Then I proceed to the Work, and multiply 2, Numerator of the first Term, by 8, the Denominator of the second, and it makes 16, which I ltiply by 7, the Denominator of the third rm, and the Product is 112 for a Denomina- of the Quotient: Then I multiply 4, the Deminator of the first Term, by 3, the Numera- of the second, and thereof cometh 12, which in I multiply by 5, the Numerator of the third rm, and I have 60 for a Numerator of the Quont. This Number 60 I place over the Denomior 112, and it makes $\frac{60}{112}$, or in lesser Terms for Answer. See the Work.

| Yards. | *lb.* | Yards. |
|---|---|---|
| If $\frac{3}{4}$ cost | $\frac{3}{8}$ what cost | $\frac{5}{7}$? |
| 2 | 4 | |
| 8 | 3 | Answer, $\frac{60}{112}$ *lb.* |
| 16 | 12 | |
| 7 | 5 | |
| nom. 112 | Num. 60 | |

If you would know what that is in Money, work by Rule 5 in Reduction.

*Example* 2.

f $\frac{4}{5}$ of an Ell cost $\frac{2}{6}$ of a Pound, what will $\frac{7}{12}$?

| | | |
|---|---|---|
| 4 | 5 | |
| 6 | 2 | |
| 24 | 10 | Answer, $\frac{70}{288}$ *lb.* |
| 12 | 7 | |
| nom. 288 | Num. 270 | |

o Resolve the following Questions, observe Directions laid down at the beginning of this pter.

(1) Of Mixt Numbers.

*uest.* 1. If $4\frac{3}{4}$ Yards of Silk cost $2\frac{3}{8}$ *lb.* how h will $14\frac{1}{4}$ Yards cost at that rate?

Qu.

*Qu*. 2. If 7 Yards of Cloth cost 4 *lb*. $\frac{3}{7}$, wh[at] will 18 $\frac{7}{8}$ cost?

(2) Of whole Numbers.

*Qu*. 3. If 18 *lb*. of Tobacco cost 2 *l*. 16 *s*. 6 [*d*.] what is the Price of 85 $\frac{2}{4}$ *lb*.

*Qu*. 4. Bought 3 $\frac{2}{4}$ Pieces of Holland, ea[ch] Piece 22 $\frac{2}{5}$ Ells, at 7 *s*. 6 *d* $\frac{1}{2}$ *per* Ell, what is t[he] Value of it at that rate?

(3) Of Compound Numbers and several Denominations.

*Qu*. 5. If $\frac{3}{4}$ of $\frac{5}{8}$ of a *lb*. of Sugar cost 4 *s*. 6 *d*. what cost a hundred Weight?

*Qu*. 6. If $\frac{2}{4}$ Yards cost $\frac{4}{5}$ of $\frac{7}{8}$ of a *lb*. what [is] the Amount of 18 $\frac{4}{7}$ Ells *Flemish*?

To prove the Rule of Three Direct in Fra[cti]ons, the way is the same as in whole Numbe[rs], namely, multiply the first Term by the four[th,] and mind the Product; then multiply the [se]cond Term by the third, and note that Prod[uct] also. Now if the two Products are alike, [the] Work is right, else not.

---

## CHAP. XIX.

### *The* RULE *of* THREE REVERS[E] *in* FRACTIONS.

QUestions in this Rule are stated as in Wh[ole] Numbers, and the Work prepar'd by R[ule] 1 of the last Chapter. Then

Multiply the Numerator of the first Term [by] the Numerator of the second, and the Product [by] the Denominator of the third Term, for a[n] Numerator of the Answer: Then multiply [the] Denominator of the first Term by the Deno[mi]nator of the second, and that Product by the [Nu]mer[ator]

rator of the third Term for a new Denominator. This new Fraction thus found, is the fourth Term, or Answer to the Question.

*Example.*

If I lend my Friend $\frac{3}{5}$ of Twenty Pounds for of a Year, how long must he lend me $\frac{3}{8}$ of Twenty Pound to return my Kindness?

The three Terms being placed according to order will stand thus.

If $\frac{3}{5}$ require $\frac{5}{13}$ Years, how long will $\frac{3}{8}$ require? Then I multiply 3 (the Numerator of the first Term) by 5 (the Numerator of the second) and produceth 15, which I multiply by 8, the Denominator of the third Term, and of it comes 120 for a new Numerator of the Answer: So I multiply 5, the Denominator of the first Term, by 13, the Denominator of the second, and it makes 65, which I multiply by 3, the Numerator of the third Term, and the Product 195 for a new Denominator; so the new Fraction is found to be $\frac{120}{195}$. which is the fourth Term, or Answer to the Question.

Thus,

If $\frac{3}{5}$ —— $\frac{5}{13}$ —— $\frac{3}{8}$

| | | |
|---|---|---|
| 3 | 5 | |
| 5 | 13 | Answer, $\frac{120}{195}$ |
| 15 | 65 | |
| 8 | 3 | |
| Num. 120 | Denom. 195 | |

Qu. 1 If 10 Men can mow $18\frac{2}{4}$ Acres in $14\frac{2}{4}$ Days, how long will 4 Men be doing the same?

Qu. 2 If $\frac{2}{4}$ of any Drapery that is $2\frac{1}{4}$ Yards wide, is sufficient to make a Garment, how much must I have of that sort which is $\frac{4}{5}$ of a Yard wide to make the same Garment?

Qu. 3.

*Qu.* 3. If when Wheat is $5\frac{2}{4}$ *s. per* Bushel, Penny White Loaf weiths $8\frac{1}{4}$ Ounces, what it weigh when When is $7\frac{6}{12}$ *s. per* Bushel?

The last Question shew the Method of ca lating the Assize of Bread, as tho Price of W doto rise or fall.

## CHAP. XX.

### *RULES of PRACTICE.*

I. THIS Rule teaches how (by the Pric one thing) to find the Price of any N ber of things at that rate.

II. All the possible Cases that can happen this Rule, may be perform'd by the Gol Rule Direct, by this

General Rule.

As 1 is to the Price of any one thing, so is Number of the same things to their Price.

*Example.*

Cloth at 1 *s.* 6 *d* $\frac{1}{2}$ a Yard, what comes 132 Ya to? *Answ.* 10 *lb.* 3 *s.* 6 *d.* See the Operation.

If 1 Yard cost 1 *s* 6*d.* $\frac{1}{2}$, what cost 132 Ya

| | |
|---|---|
| 12 | 74 |
| 18 *d.* | 528 |
| 4 | 924 |
| 74 *q.* | 4) 9768 ( |
| | 12) 2642 (6 *d.* |
| | 2\|0) 20\|3 *s.* |

Answer, *lb.* 10 3 *s.* 6

III.

I. But there are briefer Rules to work Pra-, which has 4 Cases.

) When the Price of one is 1 *s.* or,

) Less than 1 *s.* or,

) More than 1 *s.* and

) When the given Number hath odd Weight easure annext.

*Case* 1.

When the Price of one is 1 *s.* divide the Number by 20, that is, cut off 1 from the , and take half the rest for Pounds, the Re-der is Shillings.

*Example.*

1 *s.* a Yard, what comes 4321 Yards to ?

2|0) 432 (1 *lb.* *s.*

Answer 226 1

225

*Case* 2.

If the Price of one be given in Pence, it be either an Aliquot [or even] or an Ali- [or uneven] part of a Shilling.

en it is an Aliquot [or even] part of a Shil-uch as 1 *q.* 2 *q.* 3 *q.* 1 *d.* 1 *d.* 2 *q.* 2 *d.* 3 *d.* 4*d.* . then proceed by the following Table.

| | | |
|---|---|---|
| 1 *q.* | Divide the given N°. by | 48 |
| 2 *q.* | | 24 |
| 3 *q.* | | 16 |
| 1 *q.* | | 12 |
| 1 *d.* 2 *q.* | | 8 |
| 2 *q.* | | 6 |
| 3 *q.* | | 4 |
| 4 *q.* | | 3 |
| 6 *q.* | | 2 |

Quotient shall be the Price in Shillings; ring into Pounds, by cutting off 1 from ht, and taking half the rest, as before.

*Example.*

*Example.*

At 4 *d.* a Pound, what comes 325 Pound

| *d.* | | *lb.* | |
|---|---|---|---|
| 4 | 3) | 325 | at 4 *d.* |
| | *s.* | 10\|8 | 4 *d.* |

*lb.* 5 8 *s.* 4 *d.* for Answer.

Note, If any thing remain, it is always o fame Denomination with the given Pric one; so here (in dividing by 3) the 1 th mains is 1 Groat, or 4 *d.*

*Example* 2.

To what comes 474 *lb.* at 3 *d.* *per lb.*

| *d.* | | *lb.* | |
|---|---|---|---|
| 3 | 4) | 474 | at 3 *d.* |
| | | 11\|8 | 6 *d.* |

*lb.* 5 18 *s.* 6 *d.* Answer.

If the Price of one be an Aliquant [or un Part of a Shilling (such are all Prices unde that are not mention'd in the foregoing T as 5 *d.* 7 *d.* 8 *d.* 9 *d.* 10 *d.* 11 *d.* then you mu vide the given Number 2, 3, or 4 times.

Thus,

| If the Price of one be | | take for | | |
|---|---|---|---|---|
| | 5 *d.* | | 3 *d.* and 2 *d.* | As in the |
| | 7 *d.* | | 4 *d.* and 3 *d* | going T |
| | 8 *d.* | | 4 *d* and 4 *d.* | and divid |
| | 9 *d.* | | 6 *d.* and 3 *d.* | given Nu |
| | 10 *d* | | 6 *d.* and 4 *d* | by the Nu |
| | 11 *d.* | | 4 *d* 3 *d.* & 4 *d.* | against th |

The Quotients added shall be the Pri Shillings, which bring into Pounds as b (in Rule 4.)

*Example* 1.

At 5 *d.* a Pound, what comes 96 Pound to?

Here for 5 *d.* take 3 *d.* and ... whose Divisors (by the ...ble) are 4 ... 6.

```
          lb.      d.
3 d.  4)  96   at  5
      ---------
2 d.  6)  24
----      16
5 d.  ---------
   Answ. 40 s. or 2 lb.
```

*Example* 2.

...t 7 *d.* a Pound what comes 50 Pound to?
...ere for 7 *d.* I take ...and 4 *d.* whose Di...rs are 4 and 3; and ...ividing by 4 there ...ains 2, which is 2 ...ee-pences, or 6 *d.* ...in dividing by 3 ...e remains 2, which ... Four-pences or 8 *d.*

```
              lb.   d.
3 d.   4)     50  at 7
       ---------
4 d.   3)     12   6 d.
----          16   8 d.
7        ---------
              29 s. 2 d.
```

*Example* 3.

... 11 *d.* the Yard, what comes 212 Yards to?
...er, 194 *s.* (or 9 *l.* 14 *s.* 4 *d.*) See the Ope...n.

```
d.       Yards,        d.
4       3) 212    at   11
4       ------
3       3   70         8 d.
—       4   70         8
11          53         0
        ---------
           19|4        4 d.
           ----
      lb. 9 14 s. 4 d.
      -----------
```

Ex-

*Example* 4.

At 11 *d.* half-penny a Yard, what comes 2[…] Yards to?

| | | | |
|---|---|---|---|
| 4 *d.* | 3) | 276 at ½ | |
| 4 *d.* | 3 | 92 | |
| 3 *d.* | 4 | 92 | |
| ½ | 24 | 69 | |
| | | 11 | 6 *d.* |
| 11 *d.* 2 *q.* | | | |
| | | 26\|4 | 6 |
| | *l.* | 13 | 6 *s.* 5 *d.* |

*Case* 3.

VI. If the given Price of one be more than […] that is, any Number of Shillings from 1 to […] and the Price be given in Shillings only; t[…] multiply the given Number by the Price of […] in Shillings; the Product is the Answer in Sh[…]lings, which bring into Pounds as before.

*Example.*

At 7 *s. per* Ell, what comes 1236 Ells to?

| | |
|---|---|
| Ells | *s.* |
| 1236 at | 7 *s.* |
| 7 | |
| 865 \| 2 *s.* | |
| 432 *l.* 12 *s.* | |

But if the Price of one be given in Shilli[…] and Pence, or Shillings, Pence and Farthin[…] work the Shillings by this Rule, and the Pe[…] (for Pence and Farthings) as before (by Rule […]

*Exam*[…]

*Example.*

Cloth at 6 *s.* 4 *d.* or at 6 *s.* 4 *d.* 2 *q. per* Yard, what comes 42 Yards to?

```
Yds.      s. d.            d.    Yds.     s.  d.
3) 42 at  6  4             4  3) 42 at   6   4½
    6                      ½  24  6
 ------                       ------
  252                           252
   14                            14
 ------                           1   9 d.
  26|6                        ------
 ------                         26|7  9
 13 l. 6 s.                   ------
                               13 l.  7 s.  9 d.
```

Also, If the Price of one be given in Pounds, Shillings and Pence; or Pounds, Shillings, Pence, and Farthings: First reduce the Pounds and Shillings into Shillings, and proceed as the last.

*Example.*

Tobacco, at 3 *l.* 15 *s.* 4 *d. per* C. what comes 25 C. to?

```
 d.     C.      l.  s.  d.
 4   3) 25 at   3   15  4
        75      20
      -----   -----
       125      75 s.
       175
    --------
      1875
         8   4 d.
      --------
      188|3  4
      --------
 lb. 94003 s.  4 d.
```

In some particular Prices the Work may abridg'd by the Aliquot Parts of a Pound.

Thus,

| If the Price of one be | s. | d. | Divide the given Number by |
|---|---|---|---|
| | 1 | 3 | 16 |
| | 1 | 4 | 15 |
| | 1 | 8 | 12 |
| | 2 | 0 | 10 |
| | 2 | 6 | 8 |
| | 3 | 4 | 6 |
| | 4 | 0 | 5 |
| | 5 | 0 | 4 |
| | 6 | 8 | 3 |
| | 10 | 0 | 2 |

The Quotient shall be the Price in Pounds, and what remains is of the same Denomination with the given Price of one; so if the Price of one be 3 *s.* 4 *d.* and there remains 2 after Division, that 2 is 2 times 3 *s.* 4 *d.* or 6 *s.* 8 *d.*

*Example.*

At 3 *s.* 4 *d. per* Yard, what comes 1233 Yards to?

| Yards, | s. | d. |
|---|---|---|
| 6) 1233 (at | 3 | 4 |
| *lb.* 205 | 10 *s.* | |

*Case* 4.

VII. When the given Number hath odd Weight or Measure annext to it, work the whole Number as before; then divide the given Price by such Parts as the odd Weight or Measure is of one of the whole Number (or by the Parts of one another) the Sum of which added to the first Work gives the Answer.

*Example.*

*Example* 1.

What is the Amount of 527 C. 1 *qu.* at 12 *s.* 6 *d. per C.*

| d. | | C. | qu. | | s. | d. |
|---|---|---|---|---|---|---|
| 6 | 2) | 527 | 1 | at | 12 | 6 |
| d. | | 12 | | | | |

| | | |
|---|---|---|
| 6324 | *d.* | |
| 263 | 6 | *q.* |
| 3 | 1 | 2 |
| 659\|0 | 7 | 2 |

| q. | | s. | d. |
|---|---|---|---|
| 1 | 4) | 12 | 6 |
| | | 3 | 1 2 |

*lb.* 329 10 *s.* 7 *d.* 2 *q*, Anſwer.

Here I proceed with the whole Number as uſual, and for the 1 qu. I divide the given Price (12 *s.* 6 *d.*) by ſuch a Part as 1 qu. is of a C. namely 4, and of it comes 3 *s.* 1 *d.* $\frac{1}{2}$, which I add to the other Work, as you ſee above.

Another Example of the ſame follows.

| d. | | C. | qu. | lb. | | s. | d. | |
|---|---|---|---|---|---|---|---|---|
| 6 | 2) | 521 | 3 | 16 | at | 23 | 10 | *per C.* |
| 4 | 3 | 23 | | | | | | |

| | | |
|---|---|---|
| 10 | 1563 | |
| | 1042 | *d* |
| | 260 | 6 |
| | 173 | 8 |
| | 21 | 3 $\frac{1}{4}$ |
| | 1243\|8 | 5 $\frac{1}{4}$ |
| | 621 18 | 5 $\frac{1}{4}$ |

| q. | | | s. | d. |
|---|---|---|---|---|
| 2 | | 2) | 23 | 10 |
| 1 | | | | |
| | *lb.* | 2 | 11 | 11 |
| | 14 | 2 | 5 | 11 $\frac{1}{2}$ |
| | 2 | 7 | 2 | 11 $\frac{3}{4}$ |
| | | | 0 | 05 |
| 3 *q.* | 14 *lb.* | | 21 | 03 $\frac{1}{4}$ |

For the odd Weight in this Example, I divide the Parts one out of another, and add the Total as before.

# CHAP. XXI.

*Short Ways to cast up Merchandize, fit for Retailers of small Parcels, as Mercers, Linnen and Woollen-Drapers, Haberdashers of Hats, &c.*

I. WHen the Number of things exceeds not 10, the readiest way is to multiply the Price of 1 by the Number of things.

*Example.*

| | | | |
|---|---|---|---|
| Sold 7 Yards at | 14 *s.* | 6 *d.* | a Yard. |
| | | 7 | |
| *Facit* ℔ 5 | 01 | 6 | |

Say, 7 times 6 *d.* is 42 *d.* that is 3 *s.* 6 *d* set down 6 *d.* and carry 3 *s.* to the place of Shillings, and say, 7 times 4 *s.* is 28 *s.* and 3 that I carry is 31 *s.* set down 1 *s.* and carry 3 Angels (or 3 Ten Shillings) to the place of Tens of Shillings, and say, 7 times 1 is 7, and 3 I carry, is 10 Angels, which is 5 *l.* set 0 in the place of Tens of Shillings, and 5 in the place of Pounds; so the Price of 7 Yards is 5 *l.* 1 *s.* 6 *d.*

II. For any Number of Things, betwixt 10 and 100, find a Number in your Multiplication-Table that being multiplied together, will make the given Number, then multiply the Price of the thing by one of those Numbers, and the Product by the other Number.

*Example*

*Example.*

| | l. | s. | d. |
|---|---|---|---|
| Sold 14 Yards at | 1 | 07 | 10 |
| | | | 7 |
| | 9 | 14 | 10 |
| | | | 2 |
| *Facit* | 19 | 09 | 08 |

Here I multiply by 7 and by 2, because 2 times is 14.

III. When you cannot find the given Number n your Table of Multiplication, then multiply y two such Numbers, as being multiplied together, will come nearest to it, and multiply the given Price of one by the Part that is wanting. As n this Example.

Sold 30 Ells at 7 s. 9 d.

| | |
|---|---|
| 7 s. | 09 d. |
| | 2 |
| 15 | 06 |

| | | | |
|---|---|---|---|
| | | | 7 |
| | 2 | 14 | 03 |
| | | | 4 |
| | 10 | 17 | 00 |
| | | 15 | 06 |
| *Facit* | 11 | 12 | 06 |

Here I multiply by 7 and 4, because 7 times 4 is 28; and for the 2 Ells that are wanting, I multiply the Price by 2, and add the Product to the former.

IV. For Goods sold by by the Hundred weight or 112 lb. Multiply the Price in Pence that 1 lb. costs, by 7, and divide the Product by 15, the Quotient is the Price (in Pounds) of a Hundred weight.

*Example.*

At 5 *d.* a Pound, what cost 112 *lb.*

```
        7
  ─────────── l.  s.  d.
  15) 35 ( 2   6   8 the Answer.
      30
     ────
       5
      20
     ────
  15) 100 ( 6 s.
       90
      ────
       10
       12
      ────
       20
       10
      ────
  15) 120 ( 8 d.
      120
      ────
      000
```

Say, 15 in 35, 2 times rests 5, which is 100*s.* then 15 in 100, 6 times and 10 remains, which is 120*d.* Then 15 in 120 is 8 times. *Facit* 2 *l.* 6 *s.* 8 *d.*

Otherwise, By the 1st, 2d, or 3d Rule, multiply 2*s.* 4*d.* by the Number of Farthings in the Price of a Pound, the Product is the Price of the Hundred weight.

*Example.*

At 3 *d.* 2 *q.* a Pound, what comes 112 *lb.* to?

```
    4                              s.   d.
  ─────                            2    04
   14 q.                                 7
                                 ─────────
                                  16    04
                                         2
                                 ─────────
                   Facit   1 l.  12 s   08 d.
```

V. Fo

V. For Goods sold by Tale at 5 Score to the
undred: Multiply the Price of one (in Pence)
5, and divide the Product by 12: the Quoti-
t is the Price (in Pounds) of a Hundred.

*Example.*

At 3 *d.* a piece Limmons, what is that a Hun-
ed?

```
        3 d.
        5
      ──── l.  s.
  12) 15 (1   5
      12
      ────
       3
      20
      ────
  12) 60 (5 s.
```

Otherwise, multiply 2 *s.* 1 *d.* by the Num-
er of Farthings in the Price of one; the Product
the Price of a Hundred. Thus in the forego-
g Example repeated.

```
   3 d.                  s.  d.
   4                     2   1
 ─────                       4
  12 q.               ─────────
                         8   4
                             3
                    ───────────
              Facit  1   5   0
```

VI. For things sold by Tale, at 6 Score to the
undred, as Deals, *&c.* Take half the Price of one
n Pence) and you have the Price of a Hundred
n Pounds. Example, At 13 *d.* the Deal-board,
hat costs a hundred? *Answ.* 6 *l.* and a half, or
*l.* 10 *s.* If there be odd Farthings in the Price of
ne, for every odd Farthing add 2 *s.* 6 *d.* *Example,*
At 13 *d.* 2 *q.* the Deal-board, what costs a hun-
red? *Answ.* 6 *l.* 15 *s.* H 4 VII. For

VII. For Wine or Oyl sold by the Ton of 25 Gallons. From so many Pounds as the Ton do cost, abate so many Shillings, and the Gallons wi be worth so many Pence as there remains Pound

*Example* 1. If a Ton costs 25 *l.* what costs a Ga lon? *Answ.* 23 *d.* (or 1 *s.* 11 *d.* 3 *q.*) See the O peration.

| | *l.* | *s.* | | *s.* | *d* |
|---|---|---|---|---|---|
| From | 25 | 00 | | | |
| Subtract 25 *s.* or | 1 | 5 | | | |
| | 23 | 15 | *Facit* | 1 | 11 |

Here every Pound of the Remainder is value at 1 *d.* and every 5 *s.* at 1 *q.*

*Example* 2. At 21 *l.* 5 *s.* a Ton, what costs Gallon? *Answ.* 20 *d.* or 1 *s.* 8 *d.*

| | | | |
|---|---|---|---|
| From | 21 *l.* | 5 *s.* | subtract 25 *s.* |
| or | 1 | 5 | |
| There remains | 20 | 0 | *Facit* 1 *s.* 8 *d.* |

VIII. Contrary to Rule 4. If the Price of 1 Weight (or 112 *lb.*) be given to find the Price o a Pound, multiply the Shillings of the Price of 1 by 3, adding the odd Groats of the Price (if ther be any) and divide the Product by 7, the Quoti ent is Farthings for the Price of a Pound.

*Example*, Cheese at 23 *s.* 4 *d.* *per C.* what cost a Pound? *Answ.* 10 *q.* or 2 *d.* 2 *q.* for 23 multi plied by 3, is 69, and 1 added, is 70; which divided by 7, gives 10 *q.* the Answer.

IX. Contrary to Rule 5. The Price of 100 thing being given, to find the Price of one: Multiply the Shillings of the Price of 100, by 3, adding the odd Pence of the Price, (if there be any) and divide the Product by 7; the Quotient is Far things for the Price of one.

*Example*

*Example.* If 100 of Lemmons cost 18 *s.* 9 *d.* what is that a-piece. *Answ.* 9 *q.* or 2 *d.* *q.* See the Operation.

| | |
|---|---|
| *s.* | *d.* |
| 18 | 9 |
| 3 | |

7) 63 ( 9 *q.*
63

0

X. Contrary to Rule 6. The Price of 120 things being given, to find the Price of one. Double the Price of 120 in Pounds, and you have the Price of one in Pence.

*Example.*

At 6 *l.* the Hundred Deal Boards, what cost one? *Answ.* 12 *d.*

If there be odd Shillings in the Price of the Hundred; for every Half Crown of those odd Shillings add 1 *q.* to the Price of one.

*Example.*

At 6 *l.* 5 *s.* the Hundred Deal Boards, what cost one? *Answ.* 12 *d.* 2 *q.*

*Some short Forms of Bills (to exercise the Rules of Practice) applicable to Business.*

Bought of *John Smart*, *March* 6. 1715.

| | *s.* | *d.* | *l.* | *s.* | *d.* |
|---|---|---|---|---|---|
| Yards of flower'd Damask, at *per* Yard, | 5 | 6 | | | |
| Yards of Lustring, at | 4 | 2 | | | |
| 2 Yds. ¾ of flower'd Sattin, at | 12 | 8 | | | |
| Yards of Srping Tabby, at | 5 | 4 | | | |



A. Gold.

*A Goldsmith's Bill.*

Bought of *Tho. Glitter, March* 27, 1715.

| | oz. | dw. | | s. | d. | l. | s. |
|---|---|---|---|---|---|---|---|
| A Mazarine Dish, weight | 37 | 10, | at | 6 | 2 | | |
| *per oz.* | | | | | | | |
| A large Tankard, weight | 42 | 15, | at | 5 | 6 | | |
| 18 Silver Spoons, weight | 36 | 12, | at | 6 | 4 | | |
| A Silver Japand, weight | 22 | 5, | at | 6 | 8 | | |

*A Linnen-Draper's Bill.*

Bought of *James Measurewell, March* 29, 1715.

| | s. | d. | | l. | s. |
|---|---|---|---|---|---|
| 24 Ells of Muslin, at | 6 | 6 | *per Ell.* | | |
| 18 Ells of Holland, at | 7 | 2 | | | |
| $16\frac{1}{5}$ Ells of Diaper, at | 3 | 4 | | | |
| 12 Ells of Doulas, at | 2 | 1 | | | |

*A Woollen Draper's Bill*

Bought of *Abraham Fairspoken, April* 2d. 1715.

| | s. | d. | l. | s. |
|---|---|---|---|---|
| 6 Yards of fine mixt, at *per* Yard, | 18 | 6 | | |
| $8\frac{1}{4}$ Yards of fine Black, at | 17 | 4 | | |
| 12 Yards of *Drap de Bury*, at | 12 | 8 | | |
| $15\frac{1}{2}$ Yards of Frieze, at | 4 | 2 | | |

*A Grocer's Bill.*

Bought of *William Sanders, April* 7. 1715.

| C. | | l. | s. | d. | | l. | s. |
|---|---|---|---|---|---|---|---|
| $27\frac{1}{4}$ | of Sugar, at | 2 | 10 | 6 | *per* C. | | |
| $15\frac{1}{2}$ | of Raisins, at | 5 | 19 | 4 | | | |
| $2\frac{1}{4}$ | of Currants, at | 2 | 05 | 8 | | | |
| $7\frac{3}{4}$ | of Tobacco, at | 4 | 10 | 6 | | | |

*A Milliner's Bill.*

Bought of *Mary Talkmuch*, *April* 12. 1715.

| | s. | d. | l. | s. | d. |
|---|---|---|---|---|---|
| 4 Suits of Knots, at *per* Suit, | 12 | 6 | | | |
| 8 Pair of Gloves, at | 2 | 4 | | | |
| 4 Sarsnet Hoods, at | 6 | 8 | | | |
| $2\frac{1}{4}$ Yds of flower'd Ribbon, at | 2 | 7 | | | |

*A Hosier's Bill.*

Bought of *Timothy Stocking*, *April* 15, 1715.

| | s. | d. | l. | s. | d. |
|---|---|---|---|---|---|
| o Pair of Thread Hose, at *per* Pair. | 3 | 4 | | | |
| 8 Pair of Womens Silk Hose, at | 8 | 6 | | | |
| 9 Pair of Mens, *Ditto* | 12 | 4 | | | |
| 6 Pair of Scarlet, *Ditto*, at | 10 | 6 | | | |

*A Wine-Cooper's Bill.*

Bought of *Aaron Grape*, *May* 6, 1715.

| | s. | d. | l. | s. | d. |
|---|---|---|---|---|---|
| 4 Gallons of White-Wine, at *per* Gallon. | 4 | 8 | | | |
| 6 Gallons of Claret, at | 5 | 2 | | | |
| 6 Gallons of Canary, at | 8 | 6 | | | |
| o Gallons of Sherry, at | 7 | 4 | | | |

Thus might I give Examples of all other Trades n general, but these being sufficient, I omit hem for Brevity sake.

CHAP.

# CHAP. XXI.

## Of TARE, TRET, and CLOFF.

BEfore I lay down the *Rules*, it will be prope to explain the *Terms* that are commonly use in these Affairs ; and they are these ;

I. *Gross-weight*, is the Weight of both Goods an Cask (or Bag, or whatever else the Goods are pu up in) as they are weigh'd all together.

II. *Neat-weight*, is the Weight of the Goods lone.

III. *Clear-weight*, is the Weight remaining, whe all the Allowances of Tare, Tret, *&c.* that are t be allow'd, are to be deducted.

IV. The *Hundred Gross*, call'd also the *Grea Hundred*, and a *Hundred-weight*, is 112 Pounds.

V. The *Hundred Suttle*, is 100 Pound. This i also call'd the *Small Hundred*, and by some (th improperly) the *Neat Hundred*.

VI. *Tare*, is the Weight of the Cask, or Ba or whatever else the Goods are put up in.

VII. *Invoice Tare.* Sometimes the Tare is mark ed upon the Cask (or Bag, *&c.*) and then it called *Invoice Tare*, signifying that the Tare ha been consider'd before the Goods were put up, ei ther by weighing the Cask, (or Bag, *&c.*) or els by Estimation: for there are divers things (especi ally Tobacco) whose Tare is held at a certain E stimate, according to the Hundred weight, Gross weight, *&c.*

VIII. *Tret*, is an Allowance of 4 lb. to the Hun dred Suttle, that is, 140 lb. for 100. This Al lowance is given (by Custom) to Freemen of *Lon don*, (unless the Bargain be made to the contrary and no Tret to be allow'd, by reason of the Cheap nes

neſs of the Price) upon all Garbled Goods, (ſuch as Indico, Pepper, Cloves, Nutmegs, and many other Grocery Druggs,) in conſideration of the Duſt, Droſs, or other impure Subſtance with which any Commodity is mixt.

IX. *Cloff*, (commonly call'd *Cluff*) is an Allowance of 2 *lb.* to every Draught exceeding 336 *lb.* or 3 Hundred weight Groſs.

Having thus explain'd the Terms, I ſhall now lay down the Rules.

X. To find the Neat weight of any Goods: The Rule is,

Subtract the Tare from the Groſs weight, and the Remainder is the Neat-weight.

*Example* 1.

| | C. | *qrs.* | *lb* | |
|---|---|---|---|---|
| Sold | 14 | 2 | 10 | Groſs. |
| Tare | 1 | 3 | 17 | |
| Reſts | 12 | 2 | 21 | Neat weight. |

*Example* 2. Sold 6 Hogſheads of Sugar, *viz.*

| Groſs, | C. | *qu.* | *lb.* | | Tare. | C. | *qu.* | *lb.* |
|---|---|---|---|---|---|---|---|---|
| N°. 1 | 14 | 3 | 15 | | | 1 | 3 | 20 |
| 2 | 17 | 1 | 10 | | | 2 | 0 | 15 |
| 3 | 16 | 2 | 14 | | | 2 | 1 | 10 |
| 4 | 17 | 1 | 10 | | | 2 | 1 | 16 |
| 5 | 18 | 2 | 17 | | | 2 | 2 | 06 |
| 6 | 14 | 1 | 22 | | | 1 | 3 | 22 |
| Sum of Gr. | 99 | 1 | 13 | | Tare, | 13 | 0 | 23 |
| Tare, | 13 | 0 | 23 | ſubtracted. | | | | |
| Reſts | 86 | 0 | 18 | Neat weight. | | | | |

But

But if the Tare be rated at so much *per C.* w[…] then find the Total of the Tare, by Rule 12 fol[…]lowing, which subtract from the Gross-weight a[…] before, and you have the Neat weight.

XI. To reduce any given Weight Gross int[…] Pounds Suttle. The Rule is ;

Multiply the Hundreds by 4, adding in the od[…] Quarters (if any be) then multiply the Produ[…] by 28, adding in the odd Pounds (if there be any[…] as was taught in *Chap.* VII. of *Reduction.*

*Example.*

In 24 *C.* 3 *qrs.* 17 *lb.* How many *lb.* Suttle ?

```
 24
  4
 ---
 99
 28
 ---
 799
199
 ----
2789
```

*Facit* 2789 *lb.* Suttle.

XII. To find the Total Sum of the Tare, whe[…] 'tis rated at so much *per* Hundred weight. Th[…] Rule is ;

By the foregoing Rule, bring the Gross-weigh[…] into Pounds Suttle, which multiply by the Ta[…] of a Hundred weight, and divide the Product by 112 ; the Quotient is the whole Sum of the Ta[…] belonging to the Gross-weight given.

*Example.*

In 24 C. 3 *qu.* 17 *lb.* How many *lb.* Tare, a[…] 14 *lb. per* Hundred weight ? *Answ.* 348 *lb.* Se[…] the Work.

| C. | qr. | lb. |
|---|---|---|
| 24 | 3 | 17 |
| 4 | | |

```
        99
        28
       ----
       799
      199
       ----
      2789 lb. Suttle.
        14 lb. Tare per C.
      -----
     11156
     2789
     -----
112) 39046 ( 348 lb. Tare sought.
     336..
     -----
      544.
      448.
      ----
       966
       896
       ---
        70
```

XIII. To find the *Tret* to be allowed in any Weight Grofs. The Rule.

Reduce the Grofs Weight of the Neat Weight of the Goods into Pounds Suttle (by *Rule* 11.) then divide the Pound Suttle by 26, and the Quotient shall be the Tret fought.

XIV. To find the *Cloff* to be allowed in any given Weight Grofs. The Rule.

This is eafily found, by allowing 2 *lb.* for every Draught that exceeds 3 Hundred Weight.

XV.

XV. To find the Clear weight of any Goods abating the Tare, Tret, and Cloff. The Rule is,

First find the Neat weight (by Rule 10.) Then reduce the Neat weight into Pounds Suttle, (by Rule 11.) Then find the Tret and Cloff (by the 13th and 14th Rule) and subtract it from the Pounds Suttle, and the Remainder is the Clear weight of the Goods, or so much as the Buyer is to pay for.

XVI. Having found the Clear weight of any Goods in Pounds Suttle, it is necessary to bring them back again into Gross weight, because the Buyer commonly pays for them by the C. weight, at so much *per* C. *&c.* Now to reduce Pounds Suttle into Gross-weight, This is the Rule.

Divide the Pounds Suttle by 28, the Quotient shall be quarters of a Hundred, and the Remainder (if any be) shall be the odd Pounds. Then divide the last Quotient by 4, and the Quotient shall be Hundreds; and the Remainder (if any be) shall be the odd quarters of a Hundred, as was taught in Chap. 7 of Reduction. An Example or two will make all plain.

*Example 1.*

A Merchant has sold 5 Hogsheads of Raisins, allowing the Buyer Tare, Tret and Cloff. The particular Weights of the Hogsheads are as follow. I demand the Clear weight (of all the Goods) that the Buyer is to pay for? *A.* 2239 *lb.* Suttle, or 19 C. 3 *qr.* 27 *lb.* Gross weight. See the Operation.

Gross

| | Grofs, | C. | qu. | lb. | C. | qu. | lb. |
|---|---|---|---|---|---|---|---|
| ♃. N°. | 1 | 1 | 3 | 26 | 0 | 0 | 21 |
| | 2 | 2 | 2 | 18 | 0 | 1 | 10 |
| | 3 | 4 | 1 | 12 | 0 | 2 | 16 |
| | 4 | 6 | 2 | 09 | 0 | 3 | 12 |
| | 5 | 8 | 1 | 19 | 1 | 0 | 15 |

utt. Grofs 24 0 00 Sut. Tare 3 0 18

ut. Tare 3 0 18 fubtracted

Refts 20 3 10 Neat wt. of the Goods.

4 mult. by 4, and the 3 *qrs* added.

Makes 83 *qrs.* of C. which multiply'd

by 28 and the 10 *lb.* added.

664

167

Makes 2334 *lbs.* Suttle. Then,

*lb.*

6) 2334 (89 Tret. (weight.

208 6 Cloff, for 3 Draughts above 3 C.

254 95 Sum of Tret and Cloff.

234

20

| | lb. |
|---|---|
| Then, from the Neat wt. in *lbs.* Suttle, | 2334 |
| btract the Sum of the Tret and Cloff, | 95 |
| d there remains the Clear weight in *lbs.* | |
| uttle, which you may reduce back again | 2239 |
| C. Grofs. by Divifion, thus: | |

4

```
        4        C.    qr.   lb.
28) 2239 (79  (19     3     27
    196   4                     The Clear-weight
    ---------                   that the Buyer is
     279  39                    to pay for.
     252  36
    ---------
     27 lb. 3 qrs.
```

*Example 2.*

Sold 4 Hogsheads of Tobacco, Gross-weight of each 4 C. 3 *qrs.* 17 *lb.* Tare 14 *lb. per* C.

```
                 4
        ---------  ----
        19   2   12
         4
      --------
        78 qrs.
        28
      --------
       726
       157
      --------
      2296 lb Suttle.
        14
      --------
      9184
      2296
      --------
112) 32144 (287 lb. the Tare sought.
     224::
     ------        Then from the whole Gross
      974:    Weight.                    2296 lb
      896:    Subtract the Tare           287
     ------                            --------
      784     Rests the Neat-weight      2009 lb
      784     which reduced into the Hun-
     ------   dred-Gross (by Rule 16) is 17 C.
      000     1 qr. 26 lb.
```

CHAP.

# CHAP. XXII.

## Of BARTER.

BArter is the Exchanging of Ware for Ware, or one Commodity for another.

II. This Rule ſhews the Merchants how they ...y ſo proportion the Prices of their Goods, as ...t neither may ſuſtain Loſs.

III. It will not be difficult for him that is per... ...ſt in the Rule of Three, to ſolve any Queſtion ... this Rule, they being all perform'd by that ...le. There are ſeveral Caſes in this Rule.

*Caſe* I.

IV. So much Goods at ſuch a Price barter'd for ...her Goods at ſuch a Price; To find how much ... the *latter* muſt be deliver'd for the former.

*RULE.*

Firſt find what the *former* Goods are worth, by ...ying, As 1 Is to the Price 1 *lb.* &c. So is the ...hole Number of *lbs.* (or the like) to the whole ...ice of the former Goods.

Then ſay, As the Price of 1 *lb.* &c. of the ...tter Is to 1, So is the whole Price of the *former* ...o the Number of *lbs.* (&c.) of the *latter* that muſt ... delivered for the former Goods.

*Example.*

Two Merchants Barter; *A.* has 3 *C.* of Pepper ... 1 *s. per lb*; *B* has Ginger at 2 *s. per lb.* How ...uch Ginger muſt be delivered for the Pepper? ...*nſwer*, 168 *lb*.

For if 1 *lb.* of Pepper coſt 1 *s.* What will 3 *C.* ...eight, or 336 *lb.* coſt? *Anſw.* 336 *s.*

Then, if 2 *s.* buy 1 *lb.* of Ginger, what will ...36 *s.* buy. 168 *lb.* which is the Anſwer to the ...ueſtion.

Caſe

*Case 2.*

V. When one Man has Goods at such a Price the lb (&c.) ready Money, but in Barter he will have such a Price: The other has Goods at such a Price the lb. (&c) ready Money; To find how he must rate his Goods in Barter so as to be no Loser.

*Example.*

Two Men exchange Merchandize, the one hath Tobacco at 2 *s.* 6 *d.* *per* lb. ready Money, but in Barter he will have 3 *s.* 6 *d* *per* lb. The other hath Cloth at 4 *s.* the Ell, ready Money: Now the Question is, how he ought to rate the Ell in Barter, to be no Loser.

*Rule*

As the Price of the first in ready Money Is to its Price in Barter, So is the the Price of the second in ready Money To its Price in Barter; that is, by the Rule of Three,

Thus,

If 2 *s.* 6 *d.* ready Money, gives 3 *s.* 6 *d.* in Barter, what shall 4 *s.* give in Barter? Multiply and divide, and you will find 5 *s.* 7 *d.* $\frac{1}{5}$: And at that Price ought the second Man to sell his Cloth in Barter, to save himself harmless.

## CHAP. XXIII.

### *Of* EXCHANGE.

I. THIS Rule teaches Merchants how to Exchange the Moneys (Weights or Measures) of one Country, into (or for) the Moneys (Weigh

Measures) of another Country: As if a Merchant pay so much Money in one City, in one sort of Money, to receive the Value thereof in another City, in another sort of Coin; and all Questions in this Rule are solved by the *Golden Rule*, or *Practice*.

II. In the Exchange of Coins, it is necessary that the *Par*, or Value of the Money in each place be exactly known.

*Note* then, that the Word *Par* signifies to equalize the Money of Exchange from one place with that of another: As when I take up so much Money by Exchange in one place, to pay the just Value of it in another kind of Money in another place.

Having noticed this, I proceed,

I. *In the* Netherlands.

Here *London* Exchanges with

*Antwerp*, seated upon the *Scheld* in *Brabant*.

*Amsterdam*, *Rotterdam*, } in *Holland*.

*Brussels* *Lisle*, } in *Flanders*.

*Dort*, *Middleburgh*, } in *Zealand*.

In these places Accompts are kept in Pounds, Shillings and Pence, *Flemish*, or (as the Merchant pleases) in Guilders or Livres.

The *Par* is 33 *s.* 4 *d.* for the Pound Sterling, [*English* Money] or at 2 *s.* Sterling for the Guilder.

1. *Of Sterling into* Flemish.

Example.

A Merchant deliver'd in *London* 390 *l.* to receive the same again at *Antwerp* in Pounds *Flemish*; I demand

mand how many Pounds he must receive? *An*
234 *l.* See the Operation by the *Golden Rule th*

If 33 *s.* 4 *d.* give 1 *l. Fl.* what shall 390 *l. gi*

```
    12                               20
   ----                            ------
   400                              7800
                                      12
                                   ------
                            4|00) 936|00
                                   ------
                          Facit  234 l. Flem
```

2. Of Flemish *Pounds into Sterling.*

*Example* 2.

Change me 234 *l. Flemish*, into Pounds Sterl
*Par* as before, by Practice thus;

```
d.          l. Fl.   s.  d.
4       3)  234  at  33  4
             33
           ----
            702
           702
          -----
           7722
             78
          -----
           780|0        Answer, 390 l. Sterlin
          -----         Proof of the last.
           390
```

*Example* 3.

How many Guilders must be paid in *Lisle*
*Par* at 2 *s.* Sterling *per* Guilder, in Exchang
249 *l.* 10 *s.* received in *London.*

| | s. | Guilder | | l. | s. | |
|---|---|---|---|---|---|---|
| If | 2 | give 1 | what shall | 249 | 10 | give. |
| | | | | 20 | | |

2) 4990

*Answ.* 2495 *Guilders.*

*Example* 4.

Change me 2495 Guilders back again into *lbs.* Sterling.

s. *Guilders,* s.
2 1|0) 249|5 at 2

*Facit* 249 *l.* 10 *s.* for Answer.

II. *In* France.

*London* Exchanges with

| | | |
|---|---|---|
| *Paris,* | the Capital City of | *France.* |
| *Lyons,* | | *Lyonnois.* |
| *Roan,* | | *Normandy.* |
| *Marseilles,* | | *Provence.* |
| *Bisanzon,* | | *Burgundy.* |
| *Bourdeaux,* | | *Guienne.* |

They keep their Accounts in Livres, Sols and Deniers, of which

| | | |
|---|---|---|
| 12 Deniers is | 1 | Sol. |
| 20 Sols | 1 | Livre. |
| 3 Livres | 1 | Crown. |
| 60 Sols | 1 | Crown. |

But generally exchange in Crowns.

The *Par* is 4 *s.* 6 *d.* Sterling for the *French* Crown, or 1 *s.* 6 *d.* Sterling for the Livre.

1. *Of Sterling into* French *Crowns.*

*Example* 1.

A Merchant in *London* remits a Bill of Exchange to *Paris,* for 370 *l.* 2 *s.* 6 *d.* Sterling; the *Par* 4 *s.* 6 *d. per French* Crown: I demand how many *French* Crowns must be paid at *Paris* for the said Bill?

*s. d.*

```
   s. d.  French Crown,        l.   s. d.
If 4  6  give  1  what ſhall  370  2  6  give?
   12                          20
   ----                       -----
   54 d.                      7402 Shillings.
                                12
                              -----
                         54)  88830 ( 1645 Crowns.
                              54:::
                              -----
                              348::
Anſw. 1645 Fr. Crowns,        324::
                              -----
                               243:
                               216:
                              -----
                               270
                               270
                              -----
                               000
```

*Example* 2.

Change me 1645 *French* Crowns into Pound
Sterling, *Par* as before.

```
d.        Fr. Crowns,   s. d.
6         2) 1645  at  4  6
                4
             -----
             6580
              822  6 d.
             ------
             740|2  6
```

*Facit* 370 *l.* 2 *s.* 6 *d.* or Proof of the la

I might here go on to inſtance Examples of t like in *Italy*, *Spain*, *Portugal*, *Germany*, &c. B becauſe they are done after the ſame manner wi thoſe already laid down above; I ſhall only men tion the *Pars*, and omit the Work.

*In* Italy.

The *Par* at *Venice* with our Sterling Money, at 4 *s.* 3 *d.* (ſometimes 4 *s.* 4 *d.*) Sterling for t Ducat.

*In* Spain.

The *Par* at *Leghorn*, *Genoa*, *Cales*, *Madrid* a oth

other parts of *Spain*, is at 4 *s*. 4 *d*. Sterling for the Dollar, or Piece of Eight.

*Im* Portugal.

The *Par* at *Lisbon*, and *Oporto*, is at 6 *s*. 8 *d*. $\frac{1}{2}$ Sterling, for the *Mil Re*, or 1000 *Re's*.

*In* Germany.

The *Par* at *Hamburg* and *Lubek* is at 32 *s*. *Flemish* for 1 *l*. Sterling.

These are the Principal Places with which *England* does commonly Exchange her Coin.

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# CHAP. XXIV.

## *Of* LOSS *and* GAIN.

I. THIS Rule shews the Merchant how to find what he gains or Loses by the Sale of his Goods.

II. There are several Cases in this Rule, and all resolv'd by the Golden Rule of 3.

*Case* 1.

III. Goods bought at one Price, and sold at another; To find what is gain'd or lost by the Sale of all the Goods.

*Rule.*

First find what is gain'd or lost in selling 1 *lb*. (or Yard, *&c*) by taking the difference of 1 *lb*. bought, and 1 *lb*. sold.

Then say, As 1 is to the Gain or Loss in selling of 1 *lb*. *&c*. so is the given Number of *lbs*. *&c*. to the Gain or Loss.

*Example.*

If 1 *lb*. (of any thing) cost 6 *d*. and be sold again for 7 *d*. what is gain'd in selling 112 *lb*.

Here I first subtract 6 *d*. from 7 *d*. and there remains 1 *d*. Then say,

If 1 *lb* gain 1 *d.* what will 112 *lb.* gain? W
and I find the Answer 9 *s.* 4 *d.*

*Case* 2.

IV. Goods bought at one Price and sold at a
ther; to find what is gain'd or lost *per Cent.*
in laying out 100 *l.*]

*Rule.*

Find what is gain'd or lost in selling 1 *lb.*
as in the first Case. Then say, As the Price
that 1 *lb.* &c. cost, is to the Gain or Loss in sell
1 *lb.* &c. so is 100 *l.* to the Gain or Loss sought

*Example.*

If 1 *lb.* (of any thing) cost 18 *d.* and be
again for 21 *d.* what is gain'd *per Cent.*

First, I substract 18 *d.* from 21 *d.* and there
mains 3 *d.* Then I say,

If 18 *d.* gain 3 *d.* what shall 100 *l.* gain? w
and I have 16 *l.* 13 *s.* 4 *d.* for Answer.

*Case* 3.

V. Goods bought at a Price; To find at w
Price it must be sold again, to gain or lose so m
*per Cent.*

*Rule.*

Say, As 100 *l.* is to the Price that 1 *lb.*
costs, so is 100 *l.* with the Gain added (or L
subtracted) to the Answer; *viz.* (that is to
the Price that 1 *lb.* &c. may be sold at, to g
or lose so much.

*Example.*

If 1 *l.* (of any thing) costs 10 *s.* how must
be sold to gain 10 *l.* *per Cent*? Say,

If 100 *l.* give 10 *s.* what shall 110 *l.* gi
Multiply and divide, and the Answer will be fo
to be 11 *s.* a Pound.

C HA

# CHAP. XXV.

## *Of* INTEREST *and* REBATE.

I. WHEN one Man lends Mony to another for a Time, upon condition that he pay him so much *per Cent. per Annum*, for the Use of it: Such Mony paid for the Use of it, is call'd the *Use*, *Loan*, or *Interest*, and the Mony lent is call'd the Principal; and so much as is allow'd *per Cent. per Annum*, [that is, for the Use of 100 Pound for a Year] is call'd the Rate. If at the Years end the Principal be not paid, and the *Interest* do not become a part of the Principal, (but is paid yearly) then it is call'd *Simple Interest*: But if neither the Principal nor Interest be paid, but at the Years end, the Interest becomes a part of the Principal, then it is call'd *Compound Interest*, or *Interest upon Interest*.

II. To find the Simple Interest of any Sum of Mony, at any Rate, for any time given.

The Rule is,

As 100 Pound is to the Rate, so is the Principal to the Interest for one Year. Then for any other time, say by the Golden Rule.

As { 1 Year, or 12 Months, or 365 Days, } { is to the Interest for one Year, so is the given Time in } { Years, Months, Days, } { to the Interest requir'd for the Time given. }

Or else work the Interest for the given Time over or under one Year, by Practice.

*Example* 1.

What will the Interest of 2275 *l.* 11 *s.* 3 *d.* come to in a Year, at 6 *l. per Cent.* State the Question thus,

| | *l.* | | *l.* | | *l.* | *s.* | *d.* | |
|---|---|---|---|---|---|---|---|---|
| If | 100 | give | 6 | what will | 2275 | 11 | 3 | give |
| | | | | | | | 6 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1\|00) | | | | | |
| *l.* | *s.* | *d.* | *l.* | 136 | 53 | 7 | 6 |
| *Facit* 136 | 10 | 8 $\frac{10}{100}$ | | | 20 | | |
| | | | *s.* | 10 | 67 | | |
| | | | | 8 | 12 | | |
| | | | *d.* | | 10 | | |

Here 2275 Pounds, 11 Shillings and 3 Pence (the Principal) is multiply'd by 6 Pound, (the Rate) by the Method formerly taught, and the Product is divided by 100, by cutting off 2 Figures. The Remainder 53 Pounds is multiply'd by 20, taking in 7 (the odd Shillings) make 1067 Shillings, which is divided again by 100, as before, and the Remainder 67 is multipliy'd by 12 taking in 3 (the odd Pence) and divided as before.

*Example* 2.

What is the Simple Intereſt of 550 Pound, 10 Shillings, for 3 Years 9 Months, at 6 Pound *per Cent. per Annum.*

| | *l.* | | *l.* | | *l.* | *s.* | |
|---|---|---|---|---|---|---|---|
| If | 100 | give | 6 | what ſhall | 550 | 10 | give ? |
| | | | | | | 6 | |

| | | | |
|---|---|---|---|
| 1\|00) *l.* | 33 | 03 | 00 |
| | | 20 | |
| *s.* | 0 | 60 | |
| | | 12 | |
| *d.* | 7 | 20 | |

Then say,
If 12 Months give 133 *l.* 00 *s.* 7 *d.* what will Years, 8 Months give? Work and you will d 123 *l.* 17 *s.* 02 *d.* ¼ for Answer: Or by actice thus,

| onths, | | *l.* | *s.* | *d.* | |
|---|---|---|---|---|---|
| 6 | 2) | 33 | 00 | 07 | the Int. found for 1 Year. |
| 3 | 4) | Mult. by 3 | | | the Number of Years. |
| 9 Mo. | | 99 | 01 | 09 | the Interest for 3 Years. |
| | | 16 | 10 | 03 ½ | for 6 Months. |
| | | 8 | 05 | 01 ¾ | for 3 Months. |
| *Answer,* | | 123 | 17 | 02 ¼ | the Interest of 550 *l.* 10 *s.* |

*Example* 3.

Unto how much comes the Simple Interest of 8 *l.* 15 *s.* for 8 Months, at 7 *l.* *per Cent. per num?*

| | *l.* | | *l.* | | *l* | *s.* | |
|---|---|---|---|---|---|---|---|
| If | 1\|00 | give | 7 | what will | 248 | 15 | give? |

| o. | | *l.* | *s.* | *d.* | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | 7 |
| 6 | 2) | 17 | 08 | 03 | | | |
| | 6 | | | | *l.* | 17 | 41 05 |
| | | 8 | 14 | 01 ½ | | | 20 |
| | | 2 | 18 | 00 ¼ | | | |
| | | | | | *s.* | 8 | 25 |
| *Answer.* | | 11 | 12 | 01 ¾ | | | 12 |
| | | | | | *d* | 3 | 00 |

II. The Way us'd by Bankers for casting up erest, is generally by Days, thus,

They bring the Principal into Pence, and muly it by the Days it is out at Interest, and di- by 6083, for 6 *per Cent*, and by 7300 for 5 *Cent.* (which are the Days of a Year multi- by 100, and divided by the Rate of Inte-)

*Example.* 1.

275 *l.* 11 *s.* 3 *d.* at Interest 70 Days, at 6 *l.* *per Cent.*

```
             l.  s.  d.
             275 11  3
              20
          ---------
           5511 s.
             12
          ---------
           66135
              70
          ---------  12)
 6083) 4629450 (761 Pence.
       42581 ..  -----
       --------  6|3 s.  5 d.
        37135    ---------
        36498  l. 3 3 s. 5 d.
        -----
         6370
         6083
         -----          l. s. d.
          287  Facit    3  3  5
```

Examp

*Example.* 2.

What is the Interest of 472 *l.* 12*s.* 06 *d.* for Days, at 5 *per Cent.*

```
                     20
              ----------
                   9452 s.
                     12
              ----------
                 113030
                    220
              ----------
                2260600
               226060
              ----------  12)
73|00) 248666|00  (3392 Pence.
       219:::     ------
       ------     28 l 2 s 8 d.
        286::     ----
        219::     l. 14 2 s. 8 d.
       ------     ----------------
        676:      Facit 14 l. 2 s. 8 d.
        657:
       ------
         196
         146
       ------
          50
```

*Of Compound Interest.*

IV. What Compound-Interest is has been ew'd above, in Sect. 1. of this Chapter. Now, To find what any Sum of Money will be in-eas'd to (being put out to Interest) in any umber of Years, and at any Rate *per Cent.* reconing Compound Interest.

The Rule is,

Multiply the Principal by the Rate, and divide e Product by 100, and to the Quotient add the

Principal, so you have the Increase the first Year, which is the Principal for the second Year, with which work as before, and you have the Increase the second Year. Do thus for all the Years propos'd as in the following Example.

What will 22 *l.* amount to in 4 Years, at 5 *l. per Cent.* Compound Interest? Say,

| | | | | |
|---|---|---|---|---|
| | | *l.* *l.* *l.* | | Multiplyers |
| | | If 100 give 5 what will 225 give | | — 5 |
| | | 11 | 25 | |
| First Year, | *l.* | 236 | 25 | — 5 |
| | | 11 | 8125 | |
| Second Year, | *l* | 248 | 0625 | — 5 |
| | | 12 | 4031 | |
| Third Year, | *l.* | 260 | 4656 | — 5 |
| | | 13 | 0232 | |
| Fourth Year, | *l* | 273 | 4888 | — 20 |
| | *s.* | 9 | 7760 | — 12 |
| | *d.* | 9 | 3120 | — 4 |
| | *q.* | 1 | 2480 | |

*Facit* 273 *l.* 09 *s.* 09 *d.* 1 *q.*

Here I multiply continually by 5, (setting the Product 2 Places to the Right, that the Pounds may stand right for Addition) and divide by 100, which is done by cutting off 2 Figures; and after the second Multiplication by not setting down the 2 first Figures of the Product, to abridge the Work of Multiplication, which would else be very large: After the last Year I multiply the four Figures cut off by 20, 12, and 4, which brings the Remainder into Shillings, Pence and Farthings.

Of

## Of Rebate or Discount.

V. *Rebate* or *Discount* is when Money is due at e end of a certain Time, and the Debtor agree ith the Creditor, to pa[illegible] [illegible]n ready Money, if will allow him so much (as they agree for) *per ent. per Aunum*, in consideration of his receiving is Money before it is due; I say, this Allowance is call'd Rebate or Discount, and the Credior must receive so much ready Money as being ut out to use (at the Rate of Discount agreed on nd till the Time it was due) it may amount to e just Sum that would be then due; Now,

To find the present worth of any Sum of Money, due at the end of any time to come, allowng Discount or Rebate at any Rate (propos'd) imple-Interest.

The Rule is,

As { 1 Year, or / 12 Months, or / 365 Days, } is to the Rate propos'd: so is the Time propos'd to a 4th. Then, As 100 *l.* dded to the 4th (now found, is to 100 *l.*) so is he given Sum to its present Worth.

*Example.*

What present Money will satisfy a Debt of 240 *l.* ue at the end of 4 Years yet to come, Discount r Rebate being allow'd at the Rate of 5 *l. per Cent. er Annum.* Answer, 200 *l.* Thus,

If 1 Year give 5 *l.* what shall 4 Years give? Work and you have 20 *l.* Then,

If 120 *l.* proceed from; 100 *l.* what will 240 *l.* proceed from; multiply and divide, and you will find 200 *l.* and so much will satisfy the Debt.

# CHAP. XXVI.

## *Of EXTRACTION of ROOTS.*

I. I Shall here mention only the Square and Cube Root.

II. The Square-Root of a Number is a Number that being ſquar'd (or multiplied by its ſelf) produces the given Number. Thus the Square-Root of 144 is 12. Now,

III. To Extract the Square-Root of any given Number,

The Rules are,

1. Point the given Number thus; make a Point over every 2d Figure, beginning at Units: The Figures thus ſeparated are call'd Points, and ſo many Points as there are in the given Number, ſo many Figures ſhall be in the Root.

*Example.*

What is the Square-Root of 54576 ?

2. The Numbers are pointed and diſpos'd for Work, by drawing a crooked Line on the right Hand of the given Number, behind which to place the Root thus.

$$\dot{5}4\dot{5}7\dot{6}($$

3. Having

| Root, | Square, |
|---|---|
| 1. | 1 |
| 2. | 4 |
| 3. | 9 |
| 4. | 16 |
| 5. | 25 |
| 6. | 36 |
| 7. | 49 |
| 8. | 64 |
| 9. | 81 |

3. Having learn'd by Heart (from the Table in the Margin) the Square of the 9 Digits, take the greatest Square that you can in the first Point next the Left Hand, and substract it from the Point, setting the Root in the Quotient, aud the Remainder under the Point, thus,

```
.  .  .
54756 (2
4
—
1
```

4. To the Remainder bring down the next Point, and annex it thereto on the Right Hand. This is called the Resolvend, thus.

```
.  .  .
54756 (2
4 :
———
147 Resolvend.
```

5. Double the Quotient, and place it on the Left Hand of the Resolvend, behind a Line, which call the Divisor.

```
   .  .  .
   54756 (2
   4 :
   ———
4) 147 Resolvend.
```

6. Seek how often this Divisor is contain'd in all the Figures of the Resolvend, except the last towards the Right Hand: Set the Answer in the Quotient, and also on the Right Hand of the Divisor, thus,

```
               .  .  .
               54756 (23
               4 :
               ———
Divisor 43) 147 Resolvend.
```

7. Then

7. Then multiply the Divisor with the Figure annexed, by the Figure last put in the Quotient, and subtract the Product from the Resolvend, setting the Remainder under it, thus

```
              54756 (23
              4  :
            ------
Divisor 43 )  147  Resolvend.
              129
            ------
               18
```

1. To this Remainder bring down the next Point for a New Resolvend, and proceed therewith as with the first Remainder in the 4th Rule, repeating the Work of the 5th, 6th and 7th Rule, thus.

```
              . . .
              54756 (234
              4 : :
            ------
Divisor, 43)  147  Resolvend.
          3)  129 :
          ----------
Divisor, 464)  1856 Resolvend.
           4)  1856
            ------
               0000
```

Note 1. Each Figure put in the Quotient being placed by the 6th Rule, and also under the last Figure of the Divisor for a Multiplier, (as is done in this Example) their Sum makes the next Divisor, which saves doubling the Quotient.

Note 2. If any thing remain at the last, make it the Numerator of a Fraction, whose Denomi-

nator

nator must be the doubled Ro t increas'd by a Unit. This Fraction joyn'd with the Root before found, gives you the nearest Square Root to that third Number.

### *The Extraction of the* Cube-Root.

IV. The Cube-Root of a Number is a Number that being Cubed (or multiply'd by it self, and that Product again by the first Number) shall produce the given Number. Thus the Cube-Root of 1728 is 12, for 12 multiply'd by 12, is 144, and that multiply'd again by 12 is 1728. Now,

V. To Extract the Cube-Root of any given Number; The Rules are

(1) Point the given Number, by putting a Point (or Prick) over every 3d Figure, beginning at Units. The Figures thus separated are call'd Points, and so many Points as there are, so many Figures shall be in the Root.

*Example.*

Extract the Cube-Root of 12167.
The Numbers are prepar'd for Work thus.

12167 (

(2.) Having learn'd by Heart (from the Table in the Margin) the Cubes of the 9 Digits, subtract the greatest Cube you can out of the first Point, thus,

| Squares |
|---|
| 1 |
| 8 |
| 27 |
| 64 |
| 125 |
| 216 |
| 343 |
| 512 |
| 729 |

$$\begin{array}{l} 12167\ (2 \\ \underline{8\phantom{167}} \\ 4 \end{array}$$

(3) To

(3) To the Remainder bring down the next Point (as in Extracting the Square-Root) and call this the Resolvend. Thus,

$$\begin{array}{l} \dot{1}21\dot{6}7\ (2 \\ 8 \\ \hline 4167 \text{ Resolvend.} \end{array}$$

(4) Square the Quotient, and multiply the Product by 3, setting it under the Resolvend, so as Units may stand under the Hundreds; Also multiply the Quotient by 3, and set it under the Resolvend, so as Units may stand under Tens; Then add together the Tripl'd Square of the Quotient, and the Tripl'd Quotient; their Sum shall be the Divisor, Thus,

$$\begin{array}{ll} & \dot{1}21\dot{6}7\ (2 \\ & 8 \\ \hline & 4167 \text{ Resolvend.} \\ \hline \text{Tripl'd Square,} & 1200 \\ \text{Tripl'd Root,} & \quad 60 \end{array} \Big\} \text{ add}$$

$$\begin{array}{l} \hline 1260 \quad \text{Divisor.} \end{array}$$

(5) Seek how often the Quotient is contain in the Resolvend, and put the Answer in t Quotient. Then multiply the Tripl'd Square the Figure last put in the Quotient, and set t Product under the Divisor, that Units may sta under Hundreds; Also square the Figure last p in the Quotient, and by it multiply the Trip

Quotie

Quotient, and ſet it down ſo as Units may anſwer Tens in the Diviſor. And laſtly, Cube that Figure, and ſet it down ſo as Units may anſwer Units.

(6) Add theſe 3 Numbers into one Sum, which call the Subtrahend.

(7) Subtract the Subtrahend from the Reſolvend, ſetting down the Remainder thus,

| | | |
|---|---|---|
| | 12167 | (23 The Cube Root. |
| | 8 | |
| | 4167 | Reſolvend. |
| Tripl'd Square, | 1200 | } add |
| Tripl'd Root, | 60 | |
| | 1260 | Diviſor. |
| Tripl'd Squ. mult. | 3600 | by 3 |
| Tripl'd Root mult. | 540 | by (9) the Square of 3. |
| Cube of 3 | 27 | |
| | 4167 | Subtrahend. |
| | 0000 | Remainder. |

8. To this Remainder bring down the next oint for a New Reſolvend, with which proceed s before, repeating the Work of the 4, 5, 6, and th Rules till the Extraction be finiſh'd. But in his Example there are no more Points to bring own, and ſo the Work is done, and the Cube-oot is found to be 23.

VI. To remember the Rule, take the following erſes.

*Point Thirds, Subtract the Cube, set Root in Quote,*
*Draw down the 2d Point, and of this note*
*It is the first Resolvend, under write*
*The whole Quote, squar'd and tripl'd, in such Site,*
*That Ones do answer Hundreds; also then*
*Write tripl'd Root that Ones be under Tens;*
*These Triples add, and 'twill Divisor be,*
*Whence 2d Figure in the Quote you'll see.*
*Then to be added, for Subtrahend, are*
*Three Things, the Multiply of Triple Square:*
*By that same Figure it's Square also take*
*To Multiply the Triple Root, 'twill make*
*The 2d Thing; and with its Cube, and so*
*These add, subtract, you have no more to do.*

## CHAP. XXVII.

## Of Measuring of SUPERFICIES and SOLIDS.

I. SUperficial (or Flat) Measure, is the measuring of Superficies [or Outsides] of Things without any Respect to their Thickness, as in measuring of Board, Glass, Wainscot, Painting, and the like. And here you must know that 144 Square Inches make a Square Foot of Superficial Measure, 9 Square Feet make a Yard Square, and 100 Square Feet is a Square; 272 $\frac{1}{4}$ Square Feet is a Square-Perch, and 160 Square Perches an Acre. This known.

II. The *General Rule* is, Multiply the Length by the Breadth, the Product is the *Content* in such Measures as the Dimensions are given in.

Exam

*Example* 1.

A Board of 8 Foot long and 15 Inches broad how many Square-Feet?

| | | |
|---|---|---|
| | 8 Foot long, | |
| Multiply'd by | 12 Inches in a Foot. | |
| Makes | 96 Inches long, which | |
| Multiply'd by | 15 Inches, the Breadth | |
| | 480 | makes 1440 SquareInches, which divide by 144 (the Square-Inches in a Foot) gives 10 Foot for Answer. |
| | 96 | |
| 144) | 1440 (10 | |
| | 144 | |
| | 0000 | |

III. But an easier way to measure Board, Glass, Sawyer's Work, *&c.* whose Content is requir'd in Feet) is to count the Breadth in Inches for so many Pence ($\frac{1}{4}$ of an Inch a Farthing, $\frac{1}{2}$ an Inch a half-penny, *&c.*) which multiply by the Length in Feet, and the Product in Shillings is the Content in Feet. Thus in the foregoing Example, for 15 Inches I count 15 *d.* or 1 *s.* 3 *d.* Then I say, 8 three-pences is 2 *s.* and 8 *s.* is 8 *s.* which with the 2 *s.* from the Pence is 10 *s.* the Content in Feet, as before.

*Example* 2.

A Glasier has done a Pane of Glass 2 Foot Inches and a half broad, and 5 Foot and a half high.

For

| | | | | | |
|---|---|---|---|---|---|
| F. In. | | *s.* | *d.* | *q.* | |
| For 2 9 $\frac{1}{2}$ count | | 2 | 9 | 2 | |
| | | | | 5 $\frac{1}{2}$ | |
| | | 13 | 11 | 2 | add |
| | | 1 | 04 | 3 | |
| | | 15 | 04 | 1 | |

Here I say, 5 times 2 *q.* is 2 *d.* $\frac{1}{2}$, then 5 times 9 *d*, is 45 *d.* and 2 *d.* is 47 *d.* or 3 *s.* 11 *d.* then 5 times 2 *s.* is 10, and 3 is 13, then $\frac{1}{2}$ 2 *s.* is 1 *s.* $\frac{1}{2}$ 9 *d.* is 4 *d.* $\frac{1}{2}$ (or 2 *q.*) remains: Then $\frac{1}{2}$ 6 *q.* is 3 *q.* the Sum 15 *s.* 4 *d.* 1 *q.* or 15 Foot, 4 Inches and one quarter.

Note, Glaziers Inch (in Superficial Measure) is 1 Foot long, and 1 Inch broad.

Glaziers Work is the most difficult to measure of all others, because they take their Demensions to the Nicety of a quarter of an Inch, therefor I shall give you another Example of it.

A Pane of Glass 4 Foot 6 Inches long and 2 Foot 4 Inches and a half broad.

| | *s.* | *d.* | *q.* | |
|---|---|---|---|---|
| | 2 | 04 | 2 | |
| | | 4 F.6 Inches. | | |
| Product by the Inches | 14 | 03 | 0 that | |
| is | 1 | 02 | 1 | added |
| Product by the Feet | 9 | 06 | 0 | |
| Sum | 10 | 08 | 1 | |

Here, in multiplying by the Inches, for every Shilling I count a Penny, and for every 3d a Farthing.

*Example* 4.

A Joyner has Wainscotted a Room 44 Foot in Compass, and 7 Foot high, How many Square Yards of Wainscotting is in that Room? *Answer* 34 Yards, 2 Foot. See the Work.

| | | |
|---|---|---|
| | 44 | Foot in Compass. |
| Multiply'd by | 7 | Foot the Height, the Product is 308, which divided by 9 (the Square Feet in a Yard) gives 34 Yards (2 F). and 2 Foot over. |
| | 9) 308 | |
| Yards | 34 | |

IV. To measure a Circle; multiply half the Diameter [or Breadth] by half the Circumference [or Compass] the Product is the Content. Otherwise, multiply the Diameter [or Breadth] in its self, and the Product by 11; divide this last Product by 14, the Quotient is the Area or Content.

V. *For the Superficies of Round, or Square Pillars,* multiply the Circumference by the Length: This is of Use in measuring Painters Work; we neglect the Bases, because they never paint them.

VI. *For Globe,* multiply the Diameter by the Circumference, the Product is the Superficial Content. This is useful also to Painters.

VII. I come now to speak of Solid Measure, such as Timber, Stone, *&c.* and here you must know, that

VIII. A Cube is a Figure like a Dye of six equal Sides; and that a Cube (or Solid) Foot is *such* a Figure, each Side being a Foot long and a Foot Broad. Now most things are measur'd by the Cubit or Solid Foot, which contains 1728 such Solid Inches. This being known.

IX. *The*

IX. *The General Rule is*, Multiply the Breadth by the Thickness, and the Product by the Length; this last Product is the Content, in such Measures as the Dimensions were given in; which if it were Inches, then you have the Content in Inches, which you must divide by 1728, (the Inches in a Foot) and you have the Content in Feet.

*Example.* 1.

A piece of Timber, 9 Inches broad, 4 Inches thick. and 16 Foot long; How many Feet doth it contain? *Answer*, 4 Foot. See the Work.

| | |
|---|---|
| | 16 Foot long, |
| Multiply'd by | 12 Inches in a Foot, |
| Makes | 192 Inches, the Length, which |
| Multiply'd by | 9 Inches, the Breadth, |
| Makes | 1728 which multiply'd |
| by | 4 Inches the Thickness. |
| 1728) | 6912 (4 makes 6912, which divided by 1728, the Quotient is 4, and so many Feet are in that Piece of Timber. |
| | 6912 |
| | 0000 |

X. But because (in measuring of Timber) the Breadth and Thickness are generally given in Inches, and the Length in Feet, therefore it may be measur'd more easily by this Rule.

Multiply the Breadth in Inches by the Thickness in Inches, and the Product by the Length in Feet; and divide this last Product by 144, the Quotient is the Content in Feet.

Thus

Thus the foregoing Example being repeated, to shew the difference betwixt this way and that,

9 Inches, the Breadth,
Multiply'd by 4 Inches, the Thickness,

Makes 36 which multiply'd
by 16 Foot, the Length,

216
36

144) 576 (4
576

000

makes 576, which divided by 144, gives 4 Foot, as before,

Note, Tho' these ways give the true Content f any piece of Square Timber, yet the Custom s, to add the Breadth and Thickness together, if they are unequal) and take half their Sum for he true Square; but that way is very erroneous, nd always gives the Content *too much?* and the reater the difference in the Sides, the greater is he Error; nevertheless, Custom has made this ay current.

XI. For Round Timber, *&c.* The general Cu- om is, to gird it with a Line, and take a quarter f the Compass for the true Square. Thus, if a ece of Timber be 44 Inches about, they measure as if it were 10 Inches Square: But this way is o very erroneous (always giving the Content ove a fifth part too little) yet this way is us'd by Measureas, and therefore I omit the true way, being seldom or never us'd.

XII. To find how many Inches in Length kes a Foot of Square Timber.

Mul-

Multiply the Breadth in Inches by the Thic-
neſs in Inches, and by the Product divide 172
the Quotient is the Anſwer.

*Example,*

A Piece of Timber, 6 Inches Square: H
long muſt it be to make Solid Foot? *Anſwer,*
Inches. See the Operation.

$$\begin{array}{r} 6 \\ 6 \\ \hline \end{array}$$

36) 1728 (48 Inches
144

288
288

XIII. To find how many Inches in Length
make a Superficial Foot, at any Breadth: Di
144 by the given Breadth in Inches, the Quot
is the Anſwer.

*Example.*

How many Inches in Length will make a
perficial Foot, at 6 Inches broad? *Anſwer*
See the Operation.

6) 144 (
24 Inches in Length

XIV. To Meaſure Planks.

Planks are meaſur'd by the Superficial F
and according to their different Thickneſs,
are *more* or *fewer* Feet allowed to the Ton, or
as in the following.

Table of the Number of Feet that make a Load or Ton of Timber, at all the different Sizes or Thickness that Planks are commonly cut.

Of Planks in Thickness

| Inch. | F. | | | |
|---|---|---|---|---|
| 4 | 150 | | 3 | |
| 3 | 200 | make | 4 | |
| 2 | 240 | a Load, | $4\frac{4}{5}$ | gives the |
| 2 | 300 | which | 6 | Quantity |
| $1\frac{1}{2}$ | 400 | divide | 8 | of Solid Feet. |
| 1 | 600 | by | 12 | |
| $\frac{3}{4}$ | 800 | | 16 | |

Of Planks in Thickness

| | | | | |
|---|---|---|---|---|
| 4 | 120 | make | 3 | |
| 3 | 160 | a Ton, | 4 | |
| $2\frac{1}{2}$ | 192 | which | $4\frac{4}{5}$ | gives the |
| 2 | 240 | divide | 6 | Quantity |
| $2\frac{1}{2}$ | 320 | by | 8 | of Solid Feet. |
| 1 | 480 | | 12 | |
| $\frac{3}{4}$ | 640 | | 16 | |

Note, 50 Solid Foot is a Load, and 40 a Ton.

XV. Any Number of Feet of Plank being given; to find how many Load, or Ton, and Feet of Timber.

*Rule.*

Divide the given Number of Feet by the Number in the 2d Column, (against the given Thickness of the Plank,) the Quotient is Loads, (or Tons;) and if any thing remain, divide it by the Number in the 3d Column, and the Quotient is Feet.

*Example.*

In 7680 Foot of 4 Inch Plank, how many Load and Foot of Timber? *Answer*, 51 Load, 10 Foot. See the Work.

15|0) 768|0 (51 Load.
75..

18.
15.

3) 30

10 Foot.

*Laus Deo Gloria*

# Books lately publiſhed by the Autho[r] of this Treatiſe.

1. A New Copy-Book of the uſual Hands [o] *Great-Britain*; with various turns of Pra[cti]cal Command of Hand. Sold by *J. Hide*, at th[e] *Stationers Arms* under the *Piazza*, behind the *Ro[yal] Exchange*, Price 1 *s.* 6 *d.*

2. *Youth's Recreation*, A New Copy-Book; *ditt[o]* Sold by *H. Overton*, at the *White Horſe* witho[ut] *Newgate*, Price 6 *d.*

3. A New Set of Single-Line Copies of the m[o]diſh Round-hand in Alphabetical Order, done [at] the Head of every Page, with Blank Paper for th[e] Uſe of Charity Schools. Sold by *J Steward*, [at] the 3 Bibles on *London-Bridge*. Price 6 *d.* or 5 *s.* [per] Dozen.



☞ Writing, Arithmetick, Merchants-Accom[pts] are Taught, and Youth Boarded by the Auth[or].

*FINIS.*

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